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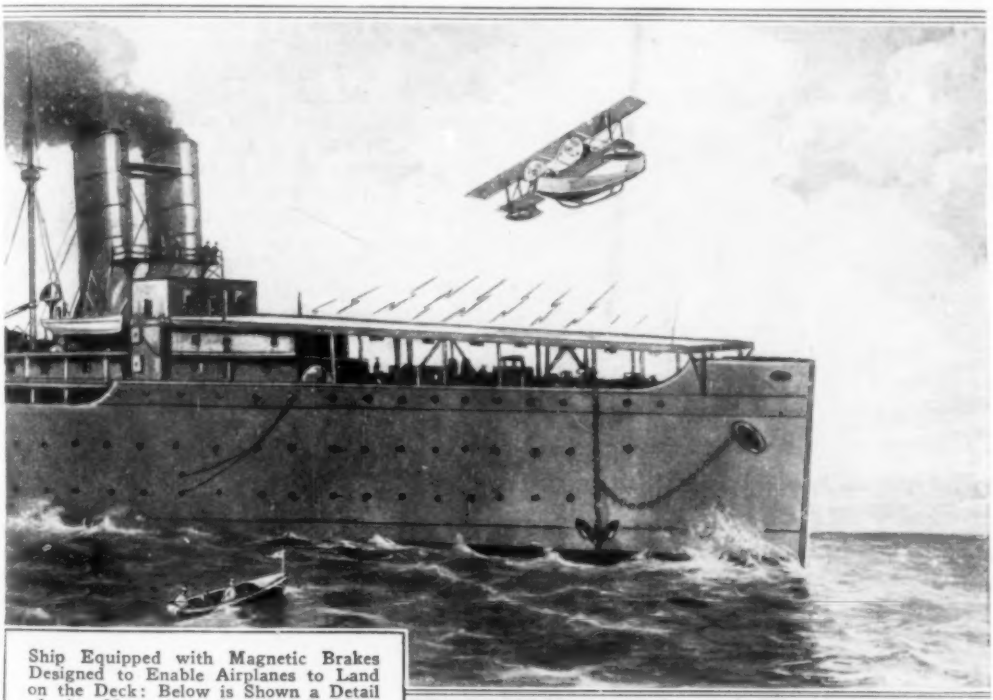
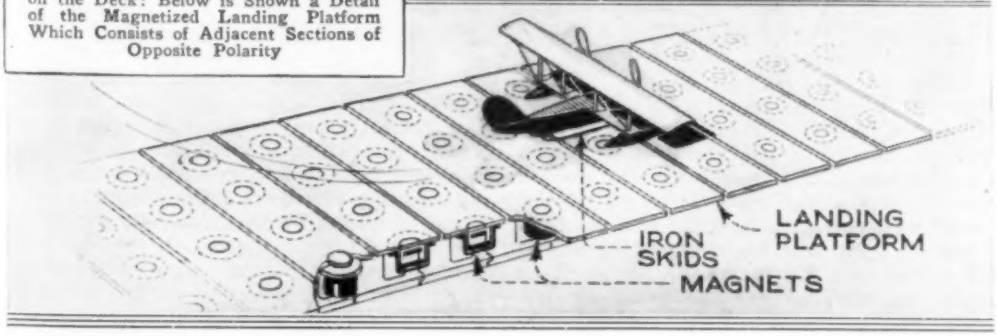
Magnetic Brake Designed to Stop Airplanes

A MAGNETIC braking device has recently been designed, that has for its object the stopping of airplanes landing on the deck of a ship, the roof of a building, or other limited area. Two somewhat similar schemes are proposed, both of which involve the use of an iron landing platform. In one, electromagnets are located at various points throughout the iron platform and are energized by turning on the current from an electric generator, in such a manner that adjacent sections are of opposite polarity. Iron-shod skids on the plane are attracted to the platform with a force that can be regulated, and in this manner the



Ship Equipped with Magnetic Brakes Designed to Enable Airplanes to Land on the Deck: Below is Shown a Detail of the Magnetized Landing Platform Which Consists of Adjacent Sections of Opposite Polarity



landing of the plane is controlled and checked to within a short distance, depending upon the strength of the magnets. The other scheme contemplates the use of electromagnets directly attached to the landing shoes, and an electric generator and control system installed in the airplane.

RIFLE AND SHOTGUN COMBINED IN FOUR-BARRELED GUN

Four-barreled guns are the latest thing in the American hunting world. Guns of this type, as made by an eastern gunsmith, generally have two rifle and two shotgun barrels, although the arrangement is occasionally varied. Two shotgun barrels of the same gauge are usually placed on top, while below them are two rifle barrels, one of high caliber and the other of low caliber. In some designs the rifle barrels are placed one above and one below the two shotgun barrels. This type of gun is of particular advantage for hunting in a territory where a wide variety of game abounds. The weight of the guns is about 8½ pounds.

Above: Gun with Two Shotgun Barrels above Two Rifle Barrels. Below: Two 12-Gauge Barrels with a Rifle Barrel Above and Below

STAGE-TO-DRESSING-ROOM CALL SYSTEM INVENTED BY ACTOR

The call boy, a position that has meant for many actors the first stepping stone on the road to theatrical fame, may be eliminated as a result of an electrical arrangement developed by an actor. This man is so fond of mechanics in an experimental way, that he carries a special tray of tools and materials for his tinkering, insisting that for him it is more than a mere fad. His own call system saves him great anxiety and is a benefit to all the members of his company.

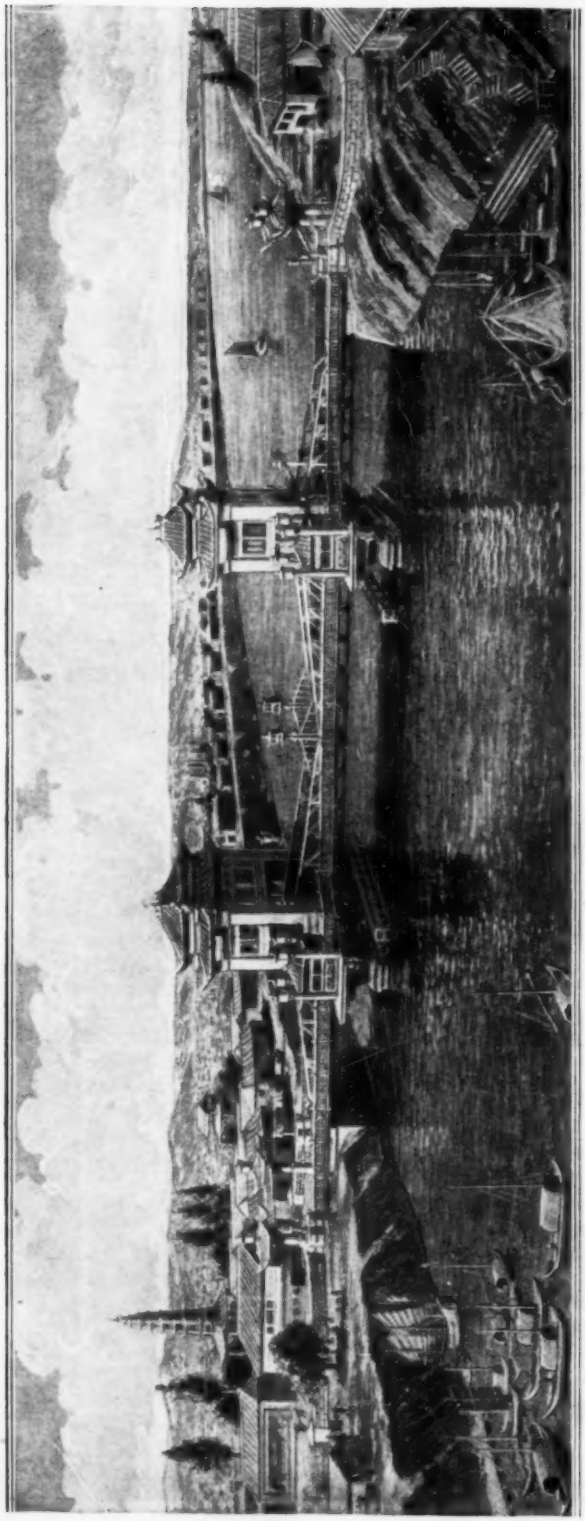
The call boy's chief duty is to hurry to dressing rooms, inform the players that the curtain will go up in one or two minutes, and then report back to the stage manager. This actor thought that too much depended upon the reliability of the boy, so he worked out an electric call system using microphones. From his own dressing room he is able to listen in on every word uttered on the stage. Two receivers have been placed in the footlight trough, one on each side of the stage, and these are wired to his dressing room. Similar connections are made to the rooms of the other leading members of the cast. As the show proceeds from one city to another this equipment is installed, and it is thought that some theaters may make it part of the house equipment.

POSTAL MOTOR CARS CROSS ALPINE PASSES

After having, some time ago, established a service of automobiles over mountain roads in Switzerland, the federal postal administration has now gone a step farther, and started a similar service over several of the highest Alpine passes, including the Klausen, 6,404 feet, and St. Gothard, 6,936 feet high. In spite of the difficulties to be contended with, such as sharp, narrow curves, and steep grades, these motor cars have been entirely successful, and have attracted many additional tourists. Besides the ordinary roadsters, there are observation cars, each equipped with a 40-horsepower motor, and having accommodation for over a dozen passengers, all seated facing forward with an unobstructed view of the scenery. The car has three powerful brakes, and by means of special steering apparatus, takes the sharpest curves without the necessity of backing up.

New Swiss Postal Motor Car on the Furka Road: The Rhône Glacier is Seen in the Background. The Sketch Below Shows Grimsel Pass, an Alpine Road of a Century Ago

An Observation Car at the Summit of the Klausen Pass, Which Here Reaches an Altitude of 6,404 Feet



COPYRIGHT, THE STRAUSS BASCULE BRIDGE CO.

Modern American Bascule Bridge Adorned with Towers and Ornaments of an Ancient Chinese Style of Architecture, Now being Erected over the Pei River, at Tientsin: The Towers Inclose the Overhead Counterweights That Are Characteristic of This Type of Bascule

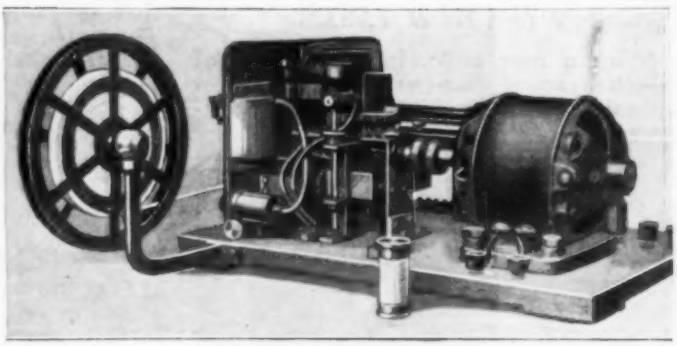
AMERICAN BASCULE BRIDGE FOR TIENTSIN, CHINA

Now being erected over the Pei River, at Tientsin, China, an entirely modern bridge of the latest American bascule type, adorned with pagoda-like towers and Chinese ornaments, will, when completed, be an interesting combination of the very old with the very new. The bridge will have a total length of 280 feet between abutments, and will consist of a vertical overhead-counterweight double-leaf span in the center, 130 feet long between trunnions, flanked on each side by 75-foot fixed spans. The overhead concrete-counterweight type was adopted because the extreme high-water level is only a few feet below the roadway level. It also furnished an opportunity for suitable Chinese architectural treatment, as the counterweights could be conveniently inclosed in the two pagoda-like towers. The bridge will have a clear roadway, 35 feet wide, and two 7-foot sidewalks on the bascule span. A double-track electric railway will be carried in the center of the roadway. Each pier consists of two reinforced-concrete cylinders, 10 feet in diameter, joined at the top by two reinforced-concrete beams with brackets, 21 feet 9 inches long. The operating machinery, which consists of a pinion engaging a curved rack on the bottom chord of the tail end of each truss, is arranged in four units, one at the end of each pier below the bridge floor. Each pinion is driven by a 15-horsepower motor, through a train of reduction gears, and will open the bridge in 1½ minutes. Above the machinery are four operators' houses, from which the bridge can be operated by hand. Normally, both leaves are controlled from one of these houses.

DUPLICATION OF ELECTROMAGNETIC ATTRACTION

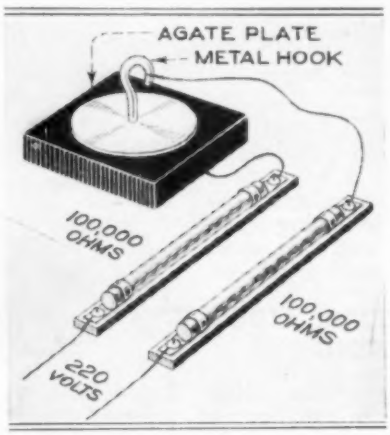
By H. A. LANE

A DUPLICATION of electromagnetic attraction without using the customary coils of wire has been produced and utilized in a practical manner by two Danish engineers, Knut Rahbeck and Alfred Johnsen. Instead of coils, plates are used. One of these plates must be a metallic electrical conductor—iron, copper, brass, or like substance being satisfactory—while the other must be but a partial conductor, such as agate, and covered on the bottom with tinfoil. Apparatus of this description constituted their experimental outfit.



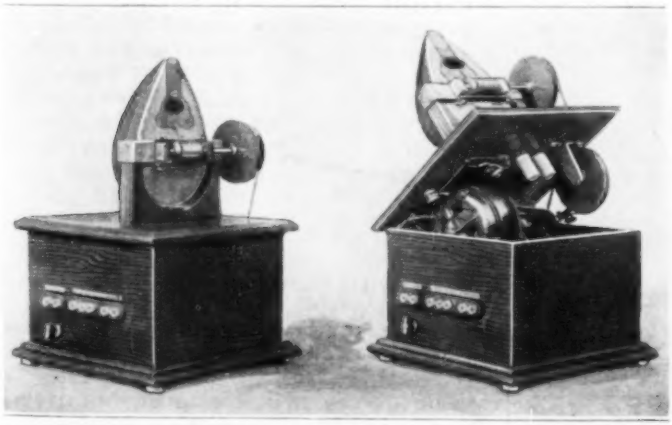
Rapid-Telegraphing Machine Which Prints from 400 to 2,000 Letters a Minute and Which is Based on the Phenomenon of Attraction between a Metal Disk and a Tinfoil-Covered Agate Plate

Using this equipment, the engineers connect one wire of an electrical circuit to the tinfoil on the lower side of the agate plate, and the other wire to the metallic plate. When the current is switched on, the plates are attracted to each other. The switching off of the current, however, immediately deënergizes the plates, causing them to assume their natural state. While this instantaneous attraction, or sticking together of the two bodies, is not a discovery nor an unfamiliar phenomenon, the adaptations to which this principle has been put by the two men are interesting.



Crude Apparatus Which Constituted the Experimental Working Outfit: A Very Small Current Suffices to Produce the Nonmagnetic Attraction

One of the adaptations of this property has resulted in the production of a rapid-telegraphing machine, with which it is possible to attain a speed of 400 to 2,000 letters a minute. Another use is that of amplifying telephone messages. Wireless is also included in the list of possibilities which the utilization of this attraction has aided. Although development of the idea has progressed but little past the experimental stage at present, work is constantly being carried on with this principle as its basis.



Two Views of an Adaptation of the Attraction Principle, in Which the Sound Box of a Mandolin, with Other Equipment, is Used for the Transmission of Musical Tones

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¶To eliminate the unsightly appearance of black lines resulting from the use of the common bituminous fillers for cracks and joints in concrete pavements, a substitute concrete-colored filler has been developed by the U. S. Bureau of Public Roads. The filler consists of a mixture of resin, crude rubber, and sufficient barium sulphate to give the desired color.

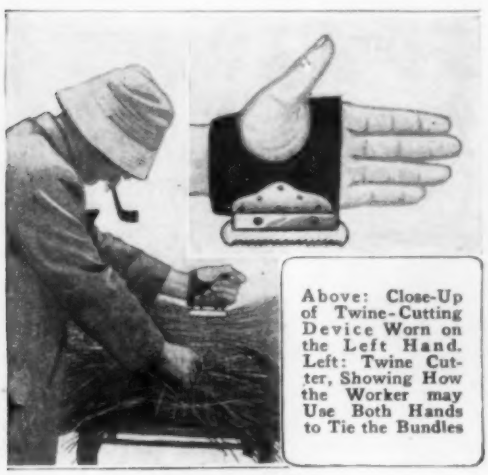
CORRECT POSTURE POSSIBLE WITH NEW TABLE

With a new table, for the design of which a noted efficiency engineer is responsible, it is possible to assume a scientifically correct posture. It forms part of a deep, comfortable rocking-chair, and is intended to be tilted to a convenient angle so as to relieve the strain upon the muscles and eyes usually following upon the constant shifting of position when writing or reading at the ordinary table.

This Convenient Reading or Writing Table can be Tilted at the Proper Angle for Fatigue Elimination and for Comfort

BINDER-TWINE CUTTER AIDS GRAIN THRESHING

A novel device for cutting the twine with which bundles of grain are bound, is intended to be worn on the worker's left hand. It consists of a leather sheath to which is attached a copper support for a detachable and highly tempered steel blade having a saw-tooth edge so shaped that the twine is cut with little effort. The worker thus has both hands free, and is not so likely to cut himself as with the ordinary loose knife.



Above: Close-Up of Twine-Cutting Device Worn on the Left Hand. Left: Twine Cutter, Showing How the Worker may Use Both Hands to Tie the Bundles

ADDED ODOR GIVES WARNING OF GAS DANGER

In order to render the escape of natural gas readily detectable, experiments have recently been made at Little Rock, Ark., for the purpose of finding a suitable substance to give the gas a distinct odor. A formula has finally been worked out, and the substance prepared from it is reported to be odoriferous, harmless, and with no effect upon the gas except as a mark of identification.

NONSLIPPING SPIKED SHOE NOW WORN BY FIREMEN

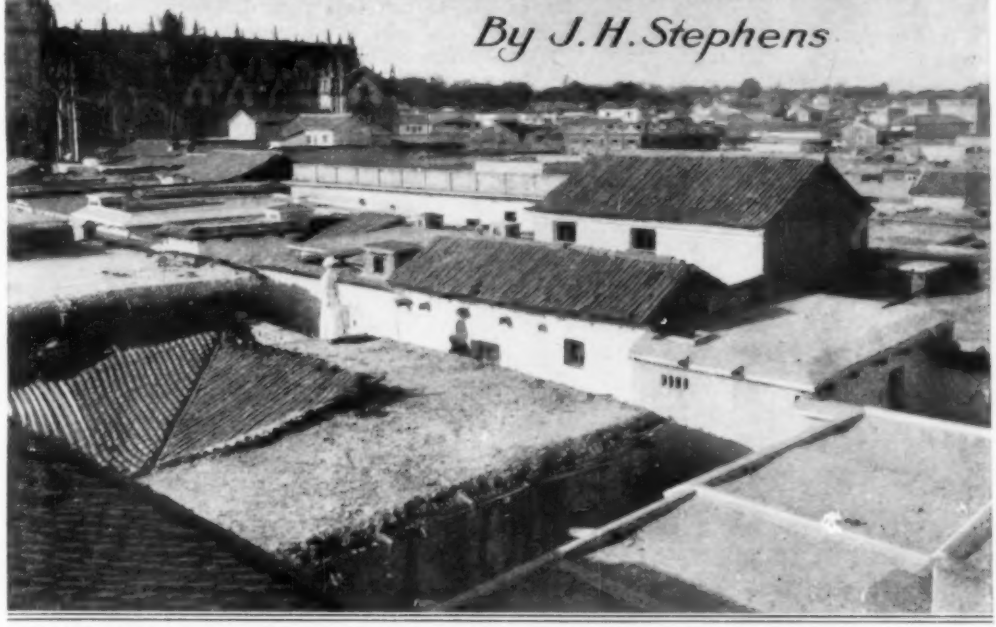
All of the $5,000,000 worth of army buildings at the Presidio, San Francisco, have steep shingle roofs, and to enable army firemen to climb these roofs without danger of falling, the fire chief has designed a safety sandal that can be strapped over the shoes in five seconds while on the way to a fire. The sandal is provided with a thick leather sole that covers all but the heel of the shoe to which it is strapped. In this sole are a number of sharp metal spikes that penetrate the wooden shingles, and prevent any possibility of slippage.

Safety Sandal for Slipping over the Shoes of Firemen: The Sharp Metal Spikes Prevent Slipping

¶ Scientists have developed a process for extracting from wheat the vitamines and mineral salts that constitute its most valuable food elements. The vitamine extract can be used for increasing the food value of any article of diet, but is primarily intended for making whole-wheat bread of pure-white color.

A PLAGUE-PROOF CITY IN INDIA

By J. H. Stephens



Part of the Native Indian City of Bangalore, Showing the Congestion of the Low, Mud-Roofed Houses: This Is One of the Sections of the City Where Plague Is Most Prevalent, Resulting from the Absence of Fresh Air and Sunlight. The Streets Are Narrow and the Houses Are Overcrowded

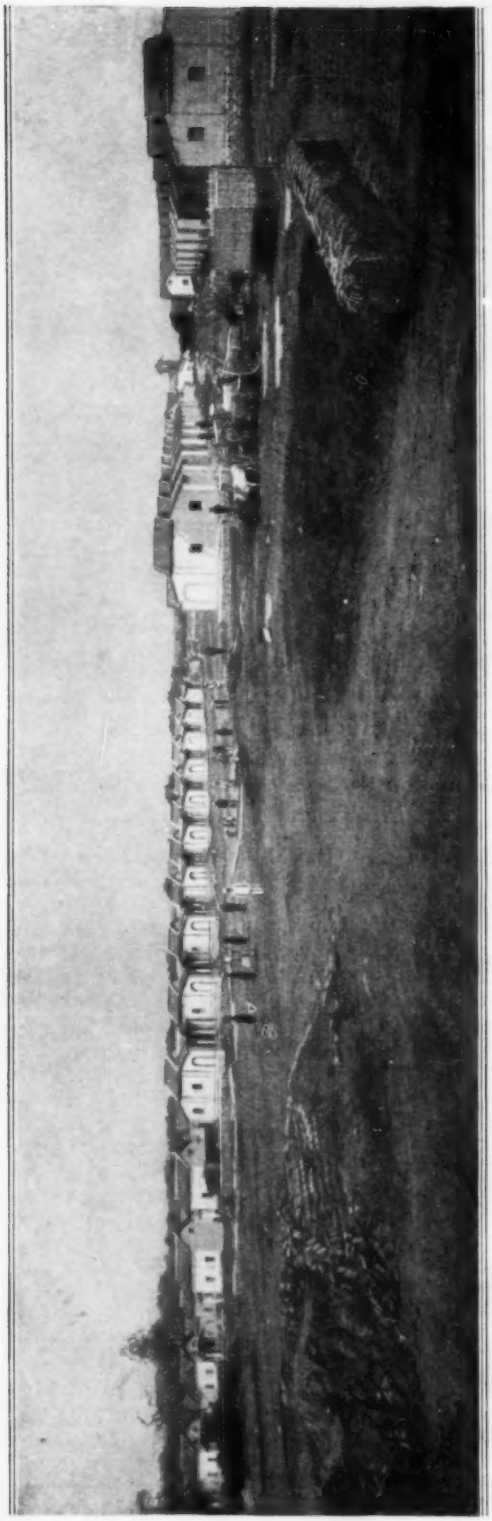
The author of this article—Mr. J. H. Stephens, of Bangalore, S. India—was engineer to the plague department from 1898 to 1912, and consequently had special facilities for studying plague in all its phases.—Editor.

ALTHOUGH Europe had suffered from many visitations of plague before and during the Middle Ages, it was not until the nineteenth century that plague came to India.

This was due to the prevalence in India of the ancient caste system of the Brahmins, which resulted in separation and segregation. The higher castes lived apart from the lower castes, and between each of such segregations open spaces were left which allowed the circulation of fresh air, and provided for expansion without congestion. Thus, unwittingly, the caste system adopted one of the most effective measures for preventing the spreading of disease.

An Indian Female Deity being Carried in Procession, Accompanied by Tom-Toms, and Whose Aid is Invoked during Visitations of Epidemics

Under British administration, caste rules were less strictly observed, and the different castes tended to converge, whilst congestion increased, resulting in the first appearance of plague in the city of Bangalore, capital of the native state of Mysore, South India. It broke out first in the most congested quarter, where sunlight and air were



Part of the Plague-Proof Settlement, Showing a Number of Small Detached Houses, Some Finished and Some Still under Construction; This Part of the Settlement Is for Occupation by Poor Natives, and Is as Uncongested as the Richer Quarters. Each House Stands on a Site One-Twentieth of an Acre in Extent, and of This Area Only One-Third is Occupied by the Building

excluded or polluted. The natives were used to cholera and smallpox, but this new disease appalled them, and they appealed to their trusted friend, the British government, for help.

Then rational and preventive means of stamping out the disease were sought for. It was found that plague often appeared and reappeared in the same house. Upon carefully examining such houses it was observed that their locations were damper than those of more immune houses. It had already been found in Bangalore that moisture is one of the contributing causes of plague. In dry weather the disease will almost entirely disappear, reappearing immediately in wet periods, when it is at its worst. In other parts of India the disease acts differently, but in Bangalore it was found that while deficient sunlight and air were causes of the plague, the nature of the soil has also a great deal to do with its mitigation or the reverse.

In seeking a permanent preventive of plague it was found that the disease had a peculiar affinity for rodents, and the house rat, being the commonest rodent, becomes its first victim. The fleas from the dead rat carry it to human beings. The rats, however, although they were the first victims of the disease, were not its first cause. This was found to be the absence of light and air that resulted from congestion. The first remedy to be adopted, therefore, was to find a place where neither of these conditions would exist.

As a first step in this direction, about 50 acres of agricultural land, with open ground all around it, was acquired on the outskirts of Bangalore, and this was laid out as a new plague-proof settlement. The roads and streets were made very wide for India, and were sunk about 18 inches below the ground level. Thus the building sites between the roads and streets were in the form of elevated platforms, which kept the houses high and dry and free from dampness and moisture during the wettest season. Small detached houses for the poor were erected with open yards around each house. The site of each building was one-twentieth of an acre, and was di-

A Congested Part of the City of Bangalore Which has been Greatly Improved by the Removal of Some of the Small Overcrowded Houses, Thus Allowing the Admittance of Fresh Air and Sunlight to the Remaining Houses: This Was a First Means of Plague Prevention

vided into three parts, only one of which could be built on, the other two parts being left as an open yard. This made the new town not only plague-proof, but also a particularly healthy and agreeable place to live in. The town has become very popular, and is financially a great success, spreading rapidly in every direction. The little houses are all built on raised foundations with basements 1½ feet high and with hard floors and roofs to make them proof against invasions by rats and aid in keeping the houses dry. This measure was first met with opposition on the part of the natives, who considered a raised house destructive of the privacy they demand for their women, but this gradually subsided. This town has been under careful supervision for several years and it has been found to be quite plague-proof.

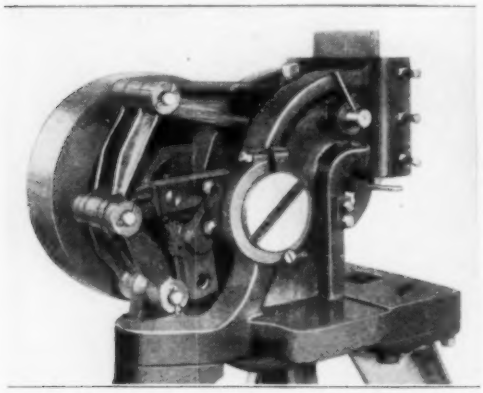
Bangalore has now learned that plague is a preventable disease, and that its bitter experiences of the past could have been avoided if overcrowding had been checked and kept under proper control.

Younger cities may learn valuable lessons from these experiences. Cities are going to expand more rapidly in the future than in the past, and if nature's laws are strictly observed, a healthier race of city population will come into being.

The Indian Method of Disposal of the Dead: At the Left is Shown the Manner of Carrying the Corpse to the Hindu Cemetery. Upon Its Arrival There, It is Laid on the Funeral Pyre. To the Right, the Pile of Wood has been Set on Fire

PUNCH PRESS OPERATIVE BY FOOT OR POWER

A small punch press that, by changing the position of a bolt with a screwdriver,

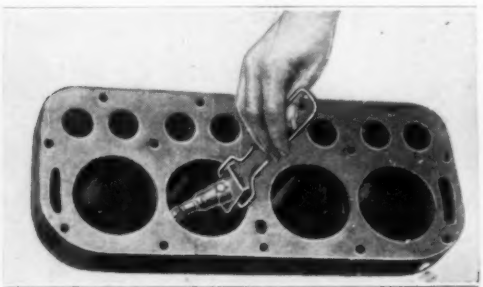


Combination Punch Press: By Changing the Position of the Bolt with the Slotted Head, the Press can be Operated Either by Foot or by Power

can be converted into either a foot or power press, has recently been placed on the market. It has an actuating mechanism of the pendulum type, and when operated as a foot press, the bolt is positioned so as to put this in connection with a swinging foot lever. By changing the position of the bolt, the pendulum is put into operating connection with the belt-driven flywheel, which is 12 inches in diameter. The stroke of the press is 1 inch, and the ram can be vertically adjusted.

SELF-ALINING AND CENTERING INSIDE MICROMETER GAUGE

Specially designed for gauging automobile cylinders quickly and accurately, a

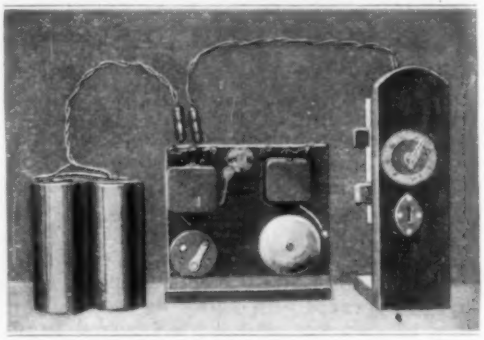


Self-Alining and Centering Inside Micrometer Gauge being Used to Measure the Bore of a Cylinder: The Small Setscrew Is for Locking It before Removal

self-alining and centering micrometer and height gauge consists of a micrometer body that has a sliding fit in the bushing of an alining base. This base is so constructed that it can be moved along the cylinder wall by means of a wire handle, and a downward pressure on this accurately centers the tool. The spindle of the micrometer is then screwed out until it touches the opposite wall of the cylinder, giving the exact diameter on the thimble, which is graduated in thousandths of an inch.

COMBINED LOCK AND ALARM HAS BELL AND LIGHT

Protection against burglars or other prowlers is provided by a combined lock and alarm in which are incorporated wiring connections for an electric bell and light. The lamp and gong may be mounted a considerable distance from the lock, and the wires extended to them. When anyone inserts a key into the lock or otherwise tampers with the bolt after the alarm has been set, current supplied from

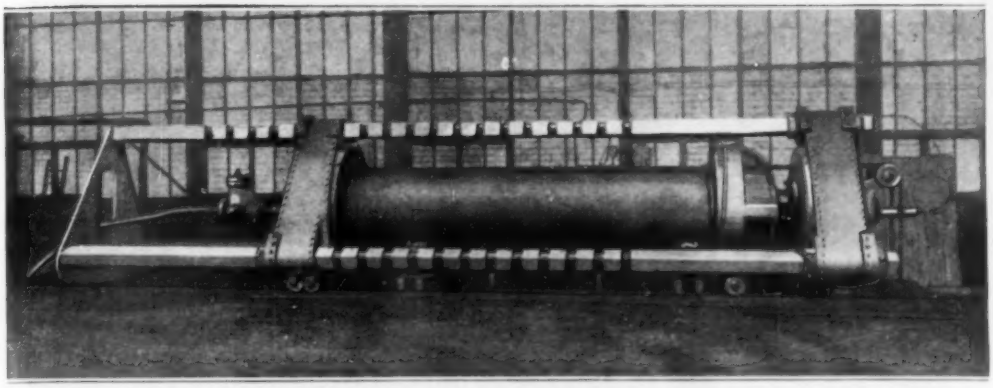


Combined Lock and Alarm, Showing the Batteries on the Left, the Alarms with Selective Switch in the Center, and Lock at the Right

a bank of batteries immediately causes the bell to ring or the lamp to light.

COLLAR SAVES SUCKLING PIGS FROM SUFFOCATION BY SOW

A collar, in connection with a body band studded with pointed steel bosses, has been devised for strapping onto the body of a suckling pig to prevent it from being smothered by the sow. The points prick the sow if she lies on the young pig, causing her to release it.



Hydraulic Testing Machine for Large Welded-Steel Pipes, Built in England, Where These Pipes Are in Extensive Use in Water Mains: The Pipe Shown under Test Is 16 Feet 6 Inches Long, 48 Inches in Diameter, ½ Inch Thick, and is being Tested at a Pressure of 260 Pounds per Square Inch

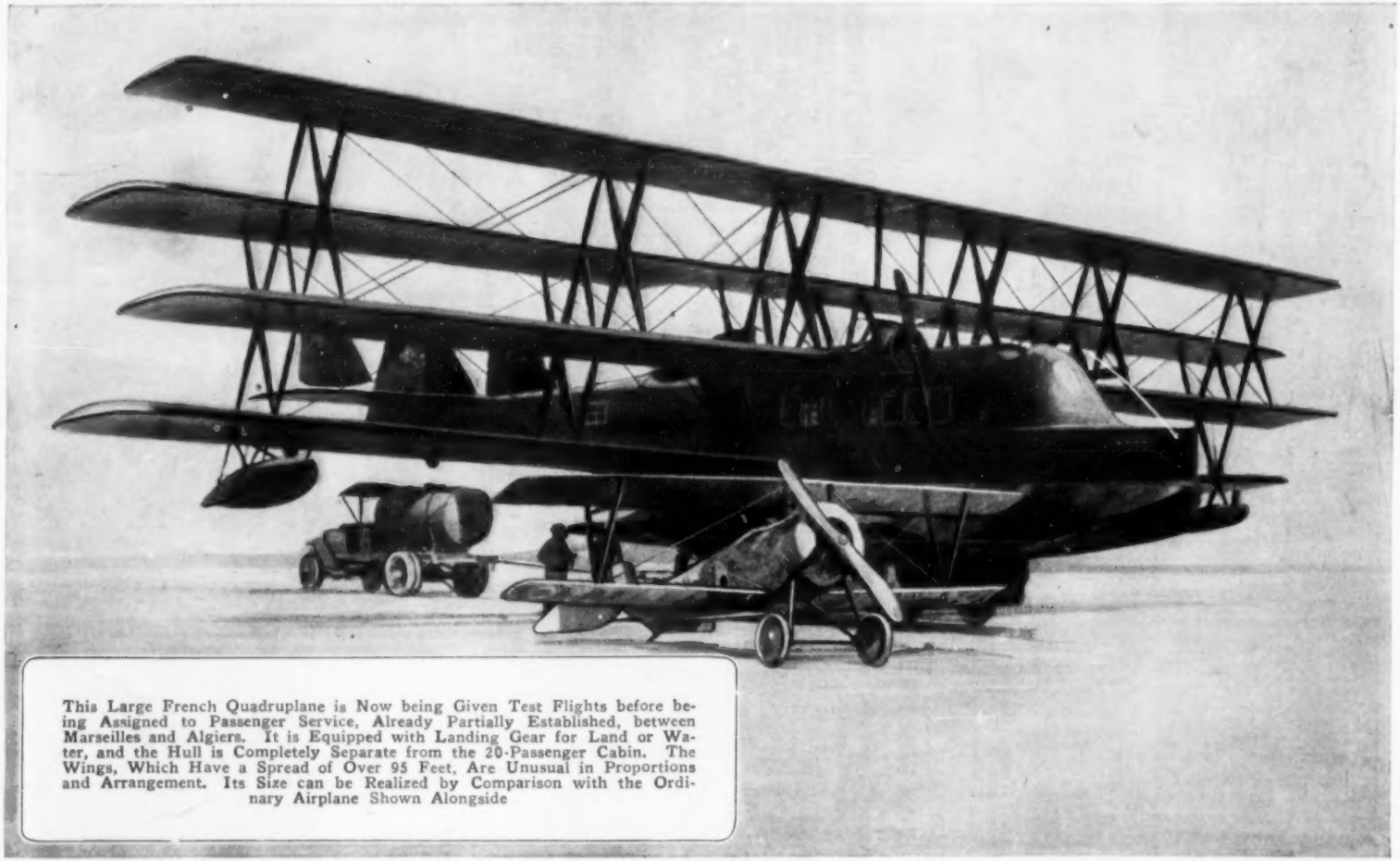
HYDRAULIC TESTING MACHINE FOR WELDED-STEEL PIPES

As welded-steel water mains are coming into extended use in England, a hydraulic machine has been specially designed there for testing the pipes of which such mains are composed. The pipe sections are of exceptionally large diameter and length, and the testing machine will admit a pipe up to 6 feet in diameter with a length of 25 feet, and will apply a pressure on the pipe up to 300 pounds per square inch. The machine is composed of two large triangular heads built of riveted plates, and stiffened so that they are exceedingly strong. The heads are tied together by three large square bars that have recesses along their entire lengths for holding stop blocks by which the machines can be adjusted for various lengths of pipe. The pressure is applied hydraulically, sometimes subjecting the heads to a thrust of nearly 400 tons.

COMBINING POTATO DIGGING AND LOADING IMPLEMENTS

In potato harvesting, by connecting a loader to the rear of a digger, both being hauled by a tractor, the potatoes can be dug and loaded simultaneously into a horse-drawn wagon moving alongside the combination. One of the two potato elevators of the loader is arranged to dump the potatoes into the wagon. These elevators are constructed with separated steel slats so that any dirt left on the potatoes will fall to the ground. The elevators are driven by a system of sprockets and chains in connection with the wheels of the loader.

Combined Potato Digger and Loader Drawn by a Tractor and So Arranged That the Potatoes can be Dug and Loaded Simultaneously into an Accompanying Wagon: This Combination, Moving at a Speed of Three Miles an Hour, can Dig and Load Approximately 800 Bushels in a 10-Hour Day



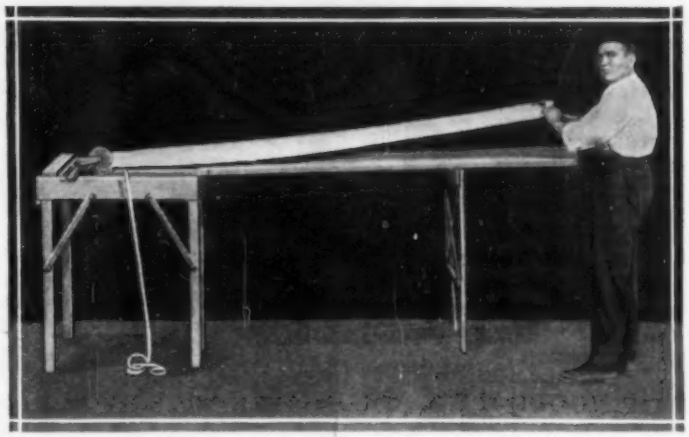
This Large French Quadruplane is Now being Given Test Flights before being Assigned to Passenger Service, Already Partially Established, between Marseilles and Algiers. It is Equipped with Landing Gear for Land or Water, and the Hull is Completely Separate from the 20-Passenger Cabin. The Wings, Which Have a Spread of Over 95 Feet, Are Unusual in Proportions and Arrangement. Its Size can be Realized by Comparison with the Ordinary Airplane Shown Alongside

FRENCH QUADRUPLANE HAS ORIGINAL FEATURES

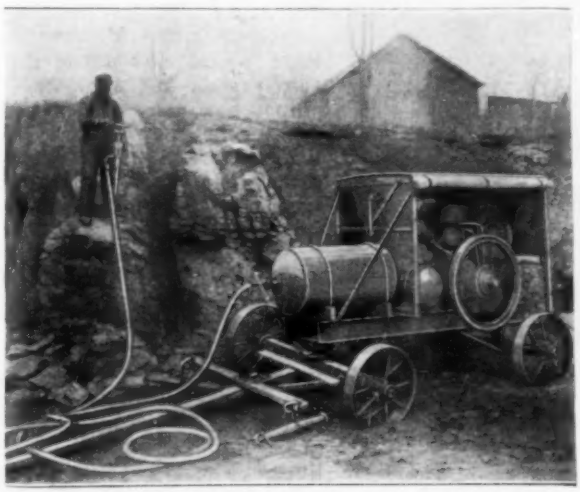
A new type of giant flying boat, now under test in France, preliminary to its use in an already partly established passenger service over the Mediterranean, embodies many radical features of design. The V-bottomed hull is designed for rough seas and is completely separate from the cabin which seats 20 passengers. The four alternately staggered wings, each fitted with ailerons and having a width of only 6 feet 10 inches to a span of 69 feet, are also unusual. The double seat for the pilots, located in the forward end of the fuselage, is accessible from the cabin and is provided with twin controls. There is also a signaling system to the engine room, similar to that on board steamships. The total weight of the airship is slightly over 10 tons and it is powered with four 250-horsepower engines arranged in two groups, connected to the two propellers.

MACHINE TRIMS AND PASTES WALLPAPER

A new machine is said to have a capacity of trimming and pasting a roll of wallpaper in three minutes. A roll of paper is mounted underneath the table and near one end of the machine, and the paper which is fed from it passes under a guide roller to the top side of a paste roller. It is then led around another and larger roller, where the surplus paste is wiped off by a brush, and the selvage trimmed off by a revolving cutter. The paper is finally drawn back over the table and cut.



New Machine Which Trims the Selvage with a Revolving Cutter, Applies the Paste, and Wipes the Surplus from the Wallpaper as the Sheet is Pulled through the Rollers: It is Said to Have a Capacity of One Roll of Wallpaper in Three Minutes



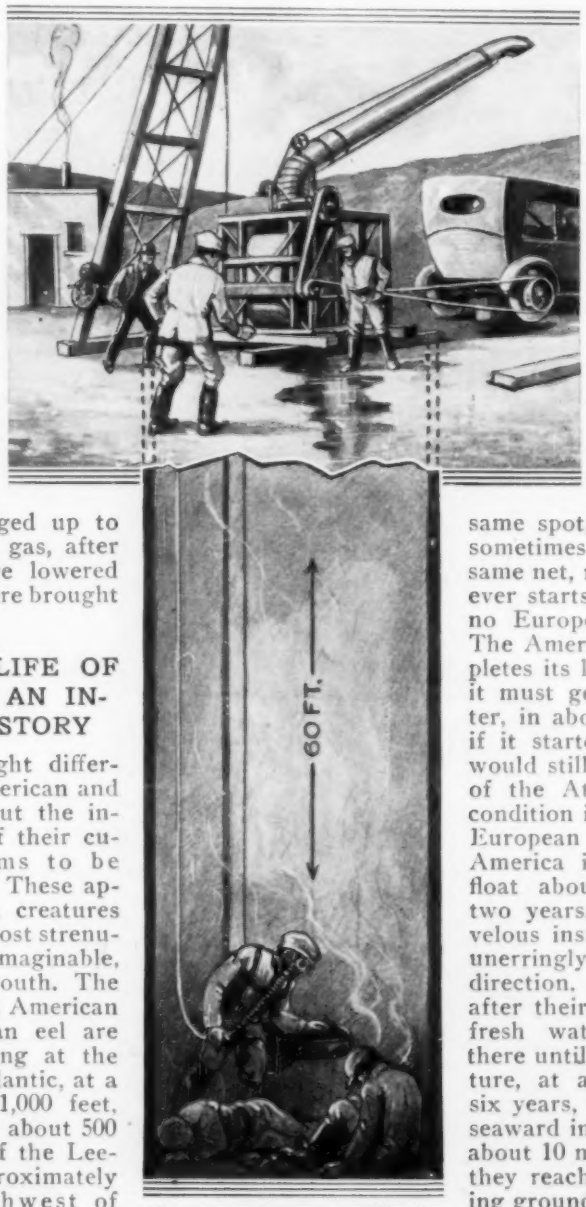
Portable Air-Compressor Unit Driven by a Gasoline Engine, Arranged to Give a Power Impulse to Each Compression Stroke of the Compressor

PORTABLE COMPRESSOR OF UNUSUAL DESIGN

A portable air compressor that is of different design from the ordinary units for similar service, provides two gas-engine cylinders direct-connected to each compressor cylinder, arranged to give a power impulse to each compression stroke of the compressor. The crank arrangement enables the maximum mean effective pressure of the engine to be applied against the heaviest part of the air-compression stroke, and the absence of gears or other transmission devices reduces frictional losses to a minimum. These units are supplied in three sizes, suitable for different capacities.

NOVEL MEANS USED TO RECOVER BODIES FROM WELL

A fine example of resourcefulness was given in the recovery of the bodies of two men asphyxiated at the bottom of a 60-foot well, which accidentally filled with gas while being sunk. One of the men was overcome, and dropped from a rope into the well when he went to investigate the disappearance of the other. A threshing-machine blower with an automobile engine as motive power, was then rigged up to clear the well of gas, after which ropes were lowered and the bodies were brought to the surface.



This Illustrates How a Threshing-Machine Blower, Driven by an Automobile Engine, was Used to Purge a Gas-Filled Well from Which It was Desired to Remove the Bodies of Two Men Asphyxiated There

STRENUOUS LIFE OF THE EEL IS AN INTERESTING STORY

There is a slight difference between American and European eels, but the interesting story of their curious lives seems to be about the same. These apparently sluggish creatures go through the most strenuous experiences imaginable, at least in their youth. The larvæ of both the American and the European eel are born in the spring at the bottom of the Atlantic, at a depth of about 1,000 feet, on a limited tract about 500 miles northeast of the Leeward Islands, approximately 2,500 miles southwest of England and, of course, very much nearer to any part of the American coast. During the first summer of their lives, the larvæ move up toward the surface, and in their second summer they start to migrate respectively toward the American and European coasts. The American larvæ reach their destination in one year, whereas it takes the European species three years to complete their migration. In each case, the larvæ require about 10 months to develop into young eels, or "elvers," and to prepare to make their way, as they do at the end of that time, up the rivers to the most remote inland pools. An extraordinary feature about these migrations is that, though the larvæ of the two species breed on the same spot, and are actually sometimes taken in the same net, no American larva ever starts for Europe, and no European for America. The American species completes its larval stage, when it must get into fresh water, in about one year, and if it started for Europe it would still be in the middle of the Atlantic when this condition is reached. If the European species went to America it would have to float about the coast for two years. By some marvelous instinct each species unerringly goes in the right direction. In both cases, after their arrival in inland fresh water, they remain there until they become mature, at about the age of six years, when they return seaward in winter, traveling about 10 miles nightly, until they reach their old breeding grounds, where, in their turn, they propagate new larvæ, and where they remain for the rest of their lives. These curious facts have been ascertained by Dr. Johannes Schmidt, a Danish zoölogist, after years of investigation.

TRAVELING DREDGE OPERATES FROM BANKS OF CANALS

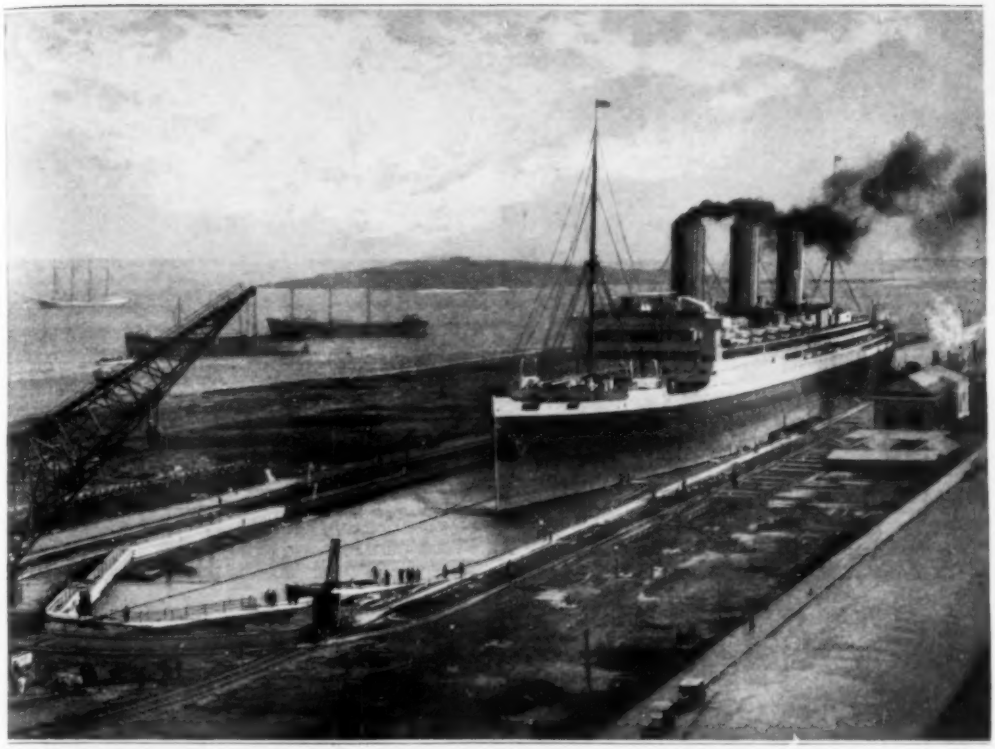
THE most recent development in methods of keeping irrigation ditches and canals clear of the silt, is the use of a type of dredge that operates from the banks of the canals. A pair of endless chains with dredging buckets, such as are used on excavators, is mounted on a saddlelike support that hangs over the canal bank and reaches below the surface of the water. In connection with this, on the bank side, are two wheels, one in front for steering, and another in the rear which is the traction wheel. A third wheel is on the end of a heavy axle that reaches the opposite bank in narrow canals, or is supported on a barge in wider ones.

DRAWING ROOM INCORPORATED IN MOTOR BUS

DRAWING ROOM seats are a feature of one of the latest motor busses to be placed in service in Chicago as shown in the accompanying picture. The passenger capacity of the vehicle is 25 persons, of which 13 may ride out in the open air at the front, the remaining 12 occupying the richly upholstered drawing room at the rear. The front seats extend across the car, facing forward, while the seats in the closed compartment are arranged so that the occupants face each other. Around the edge of the drawing-room roof is a guard rail which provides a convenient place to carry the passengers' baggage.

"MAJESTIC" NOSED TO A PIER BY EIGHTEEN TUGS

ON a recent occasion, because of exceptionally high wind and tide, 18 tugs were required to nose the "Majestic," the largest ship afloat, into its berth on the North River, in New York City. Nine tugs were lined up on each side of the huge vessel. With large fenders on their bows, they gradually brought the "Majestic" alongside the pier.



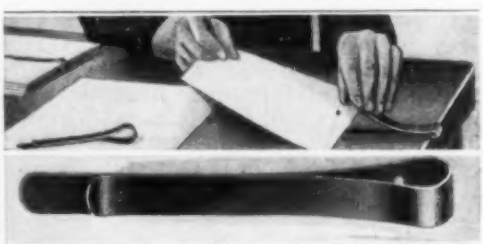
The World's Largest Steamship, the "Majestic," Shown Entering the World's Largest Drydock at Boston, Massachusetts: The Vessel Remained in the Dock for a Few Days Undergoing Repairs. The Dock Is 244 Feet Longer and 49 Feet Wider than the Largest Ship Afloat

WORLD'S LARGEST STEAMSHIP DRYDOCKED AT BOSTON

The White Star liner "Majestic," the world's largest steamship, was recently placed for repairs in the world's largest drydock, at Boston, Mass. This dock, which is 1,200 feet long, 149 feet wide, and 45 feet deep, and is one of a number of water-front improvements that has added greatly to Boston's shipping facilities, was completed during the war, and sold to the government in 1919. At the time the "Majestic" was docked in it, it was supposed to be the only drydock in the world large enough to accommodate this vessel. This aroused some controversy in England, and the Mersey Docks and Harbor Board pointed out the fact that they had a dock, known as the Gladstone Graving Dock, which is 1,050 feet long, 155 feet wide, and 46 feet deep, being, therefore, quite capable of accommodating vessels even larger than the "Majestic." There is in this country also another dock, at Portsmouth, N. H., which could accommodate the "Majestic," being 1,022 feet long, and proportionately wide and deep.

PLIABLE-STEEL PAPER CLASP IS USEFUL IN OFFICES

Made of thin flexible steel, a narrow band clasp, 6½ inches long, holds a file of correspondence of from 2 to 100 sheets for handy reference, keeps the contents of a brief case separate, is useful for holding papers on desk pads, or on the paper holders of computing machines, and is convenient in many other ways. It



Flexible-Steel Paper Clasp, 6½ Inches Long, That will Hold a File of Correspondence of from 2 to 100 Sheets, When Slipped In as Shown Above

takes the place of rubber bands and paper weights, and can be easily slipped over any bundle of papers up to 1 inch in thickness.

MUSHING WITH BEARS IN ALASKA

By STRATFORD F. CORBETT

IN Alaska they are talking of what may materialize into one of the most interesting experiments ever attempted in the north country: The Alaskan fur trader would train the polar bear to pull his sledge!

It was the representative of a large fur company who first conceived the scheme. Mushing along the northernmost rim of the continent in search of furs, he was surprised to come upon an Eskimo boy with a small sledge pulled by two polar cubs. Both bears had been in harness for some time, were fairly well broken, and showed no signs of viciousness or stubbornness.

While the Eskimo is, by necessity, too busy with hunting and fishing to attempt training the bear in a serious way, the manager of the fur company referred to sees actual possibilities in the idea for his kind of work. Polar bears—naturally swift, capable of running long distances without tiring, and strong enough to pull heavy loads—would make the most powerful sledge teams in the Arctic. Two of the species might easily pull a load that dogs could not budge, and, with six of them in harness, furs or other commodities could be transported in loads now unthinkable.

In selecting the team care would have to be exercised in eliminating animals showing predisposition to temper. It is conceded by zoölogists that there is as much difference in the dispositions and tendencies of animals of the same species as there is between humans of the same race. For example, two bears may be captured together, may be members of the same family, yet one will show signs of friendliness, a willingness to adapt itself to its new surroundings, while the other will be unruly, unmanageable, and, therefore, entirely unsuitable for training. It would be folly, of course, to waste time on an animal of bad character.

There should be little trouble with a team, well-trained—and there is much to be gained, not only in heavier loads but in speed. While the Eskimo dog usually averages anywhere from 20 to 40 miles per day the bear under the same conditions is capable of doing 100 miles or more. Even Perry, who, if anyone, knew how to get the best from his dogs, never expected to make more than 50 miles a day consistently. The polar bear can travel twice that distance and do it day in and day out.

On the march, large quantities of food, seal, fish, and birds, would have to be carried for the team—a much larger quantity than the dogs would consume, but even allowing for this extra weight, the bear would be a far better transport animal than the best of dogs.

This one fact is a great advantage, and it may be that what is now a sport in a small section of Alaska will in time become a common practice all through the Arctic.

"Naturally swift, capable of running long distances without tiring, the bears would make the most powerful sledge teams in the Arctic."

HUGE OIL TANK SET ON FIRE BY ELECTRIC DRILL

A burning oil tank of 50,000-barrel capacity, near Whittier, Calif., recently attracted a curious throng of onlookers. The oil was ignited by sparks from an electric drill which workmen were operating near the top of the tank for the purpose of installing a gauge. Flames and dense black smoke immediately rose into the still air for a distance of 600 feet, in a huge column, and then spread out like a mammoth fan over the heads of the spectators. Efforts to quench the fierce blaze proved unavailing, and the picturesque fire continued until the contents of the tank, estimated to be worth $100,000, were destroyed.

Huge Oil Tank Which was Set on Fire by Sparks from an Electric Drill, Showing How the Dense Clouds of Black Smoke Rose in a Column over the Heads of the Spectators before Spreading Out in the Shape of a Large Fan

¶ A new marine life belt, resembling the old form of body belt, but with buoyancy sufficient to support five or six persons clinging to life lines attached to it, has been demonstrated in France.

PLAYING TIME IS INCREASED ON PHONOGRAPH RECORDS

By controlling the speed of a revolving phonograph record, an English inventor gets 20 minutes of music on one side of a 12-inch record, instead of the usual four minutes or thereabouts. When the record disk revolves at a uniform angular speed, as at present, the outer groove of the record moves more swiftly than any other groove that is nearer to the center. Thus, although the outer groove is about four times as long as the inner one, it can contain no more music, making necessary a variation in the recording speed. In the new method, the recording speed is made constant, and by correspondingly controlling the speed of the record, the impression upon it of a very much greater number of sound vibrations is made possible. When being played, the record revolves slowly at the start, and then gradually speeds up.

RESULTS OF EXPLORATIONS MADE IN COLORADO

In Mesa Verde National Park, Colorado, explorers from the Smithsonian Institution recently unearthed a new prehistoric ruin, to which the name of "Pipe Shrine House" was given because over a dozen clay tobacco pipes were found in the shrine, where they had been thrown down centuries ago during ceremonial rites. The pipes were in a circular pit, 20 feet deep and about the same in diameter, that was in the middle of a rectangular building, about 75 feet square and one story high, with a circular tower 15 to 20 feet high. In a cemetery near this house one of the skeletons was left without moving a single bone, and an inclosure was built around it on which a waterproof covering was placed, through which a visitor can observe the skeleton, with the food bowls and other relics, just as they were left over 500 years ago. This is the first time, it is said, a relic has been so preserved.

CHURCH FURNISHES STONE FOR AUTOMOBILE ROAD

The complaint is often heard nowadays that churches and automobiles are matters of conflicting interest. But such a complaint cannot be made at Naperville, Ill., for the Church of Saints Peter and Paul has actually furnished part of the stone ballast for the concrete automobile road between Aurora and Chicago. This was, however, not a spontaneous gift on the part of the church, but was due to a fire which gutted the church a short time ago, and left only the walls and part of the belfry standing.

Top: Church at Naperville, Illinois, the Fire-Gutted Walls of Which Furnished Ballast for an Automobile Road. Above: Crusher Breaking Up the Stone Walls of the Church. Right: Temporary Belfry Where Chimes are Hung Until New Church is Completed

As the church was built of limestone with a facing of concrete, it was bought by the contractors for the ballast it would make. Limestone often bursts with explosive violence, as is well known by campers, who avoid using it in or near a camp fire, and the walls of the church were badly cracked, though not showing from the outside. During the fire the bursting limestone could be heard quite a distance. The church will be rebuilt as soon as possible, and in the meantime the chimes have been hung in a temporary belfry near by, where they ring out a reminder of the hours of worship.

EXTENDING BOMBAY, INDIA, BY RECLAMATION WORK

Extensive reclamation work is being carried out at Bombay, India. By means of a great inclosing sea wall, four miles long, 1,145 acres of Back Bay will be reclaimed. The estimated quantities of material required for this wall in cubic feet are: rubble, 9,223,280; heavy pitching stone, 3,465,500, and concrete, 3,694,690. An additional work of smaller importance is another reclamation of some 132 acres. The estimated total cost of these enterprises, less interest during the six years required for completion, is £583,333. The reclamation will have a system of wide roads and a well-planned street-railway service, all laid out so as to provide for a future subway system, which will eventually be necessary. Along the sea front will be a promenade at least 40 feet wide. At the southern end of the reclamation, there will be a military reservation of about 265 acres.

THREE TUBES WORK AS SIX IN "REFLEX" RADIO SET

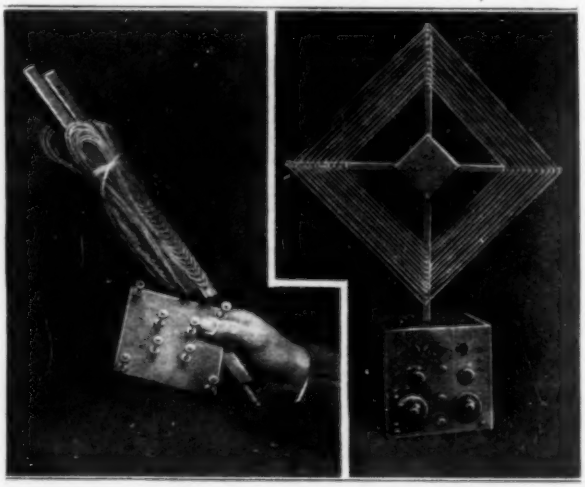
Three vacuum tubes do the work formerly allotted to six, in a compact radio-receiving set displayed by an eastern manufacturer of wireless apparatus at the recent Boston radio show.

The set provides three stages of radio-frequency amplification and two stages of audio-frequency amplification. The circuit is arranged in such a manner that after the radio frequency of the incoming wireless waves has been amplified three times by the vacuum tubes, the waves are passed back through two of the tubes for further amplification at audio frequency.

The circuit used in passing back the waves through the same tubes is termed a "reflex circuit," and the set a reflex receiving set. The manufacturer of the set claims that it is even more efficient than a set providing six tubes, each one used for a separate amplification, while the user of the set saves the cost of additional tubes and the space that would be needed for the amplifying unit containing the tubes.

The entire set, with the exception of batteries and the antenna, is housed in a box approximately 8 by 8 by 6 inches, and weighs only 8 pounds. It is stated that it has a reception range of 1,000 miles with its tiny indoor loop antenna. The range can be enlarged through the use of an outdoor antenna, connections for which are provided on the face of the box. The set is controlled by a single tuning knob, allowing the novice to operate it efficiently.

The indoor loop antenna used with the set is collapsible and very simple in construction. Sixteen strands of fine wire form the loop, and when set up it is only 2 feet high and 2 feet wide. Its base rests in a socket in the receiving set and the operator can swing it around easily with one hand. The four arms of the antenna, when in use, are held rigidly in extended position by means of a square metal plate at the crossing point of the arms, to which it is fastened by thumbscrews. When it is desired to take down the antenna, these screws can be quickly removed with the fingers and the antenna arms closed up, in much the same manner as an umbrella, into a compact bundle.



Left: Collapsed Loop Antenna of the "Reflex" Radio-Receiving Set, Together with the Metal Plate Which is Used to Hold the Loop Rigid When It is Opened. Right: Set Shown Erected in Readiness for the Reception of Broadcasting

Above: Exposure Meter for Setting Camera to Different Lighting Conditions and Shutter Opening. Left: Exposure Meter in Use

EXPOSURE METER SIMPLIFIES PHOTOGRAPHY

A handy exposure meter has just been brought out that shows the operator how to set his camera to obtain properly exposed pictures under the existing light conditions. It consists of a metallic scale with a slide and five circular windows of graduated degrees of transparency. The object to be photographed is first viewed from the most transparent window, and then the slide is moved to the other windows until the one is reached through which the object is just dimly visible. The correct shutter speed and diaphragm opening will be indicated on the chart.

NAVAL AIRPLANES TESTED AT DETROIT AIR MEET

The Curtiss marine flying trophy race at the recent air derby held at Detroit, offered a welcome opportunity to try out a number of small airplanes designed by the Bureau of Aeronautics of the U. S. Navy and intended to be carried on board ships from which they would operate.

The object was to develop a small and compact plane, easily taken down and assembled aboard ship, that would have efficient flying characteristics. To that end all wires and turnbuckles in the wind bracing were eliminated, and the fuel tank was located in the lower wing, so that it could be dropped overboard by a quick release in case of fire by an incendiary bullet. Another feature was the provision of interchangeable landing gear for either land or water, according to the service required. Aside from these points common to all, the planes also were all made with a wing spread of 25 feet and a length of 24 feet 7 inches, but the TR-type differed from the TS-type in that planes of that designation were fitted with special racing wings.

Small Compact Biplane Recently Developed by the United States Navy: It is Adapted for Alighting on Water, or Fitted with Landing Gear

In order to obtain information on planes of the same type with different engines, two were equipped with radial air-cooled 220-horsepower engines, and two with water-cooled engines of about the same rating. The race was won by the "TR-1," piloted by Lieut. A. W. Gorton, U. S. N., at an average speed of 112.65 miles an hour over the total distance of 160 miles, which consisted of eight laps around a closed circuit of 20 miles. Out of a field of eight that started, only one other contestant finished, owing to a series of unfortunate accidents.

While all of the engines mentioned were developed at the request of the Navy Department to meet the requirements of this particular type of air craft, it is exceptionally gratifying to our aeronautical engineers that the winner carried a power plant representing the first successful American air-cooled airplane engine. A satisfactory engine of this type is particularly important in naval planes because of the reduced weight and the absence of the radiator which is so vulnerable to machine-gun fire.

New Shipboard Type of Airplane Equipped with Pontoons for Water Service: Power is Furnished by an American Radial Air-Cooled Motor

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¶An electrical transmission line, consisting of three 600-foot spans of steel-core aluminum cable on four 65-foot steel towers, was recently erected at Purdue University for experimental purposes. On the 40-foot crossarms are 15-unit insulators, hung so that they may be moved freely without taking down the cables.

MAKING MOTION PICTURES AT THE SUMMIT OF MOUNT HOOD

By MEL WHARTON

THE difficulties of mountain scaling in the Pacific Northwest are stupendous under any conditions, but filming dramatic action on the slopes of ice-crevassed, wind-torn, and snow-swept peaks for the purpose of educating the world to the mountain climbs and snow sports in our own United States, presents obstacles which only those stanch of heart and firm of muscle dare undertake.

A complete troupe of actors and technical men, 15 in all, after 14 hours of fatiguing toil, recently reached the summit of Mt. Hood—a hazardous ascent without the impediment of motion-picture cameras and equipment. The expedition was the first in history to film dramatic action on the summit of a major snow-capped mountain. One woman, Miss Irene Marvin, leading lady, made the ascent. She is the first of her sex to defy the northeast slope of Mt. Hood, stay all night on top, and descend the opposite side.

The party arose at midnight, and at one o'clock, with flashlights and lanterns flickering against the foliage of the timber line, started upon the perilous climb. Before the first shafts of light illuminated the crest of Old Hood, they had reached the edge of the ice field which marks the beginning of the actual climb. After a short wait to rest pack-tired shoulders, the members slid into the loops of a life line and started the ascent.

Stops were made to take movies of the troupe in action on the mountainside. Miss Marvin was thrown down a crevasse, for a "thriller"—into the waiting meshes of a life net, to be sure, but nevertheless a nerve-trying ordeal because the ice is never to be trusted, and an insecure net means a catastrophe. The theater-going public feeds upon excitement, and the weaving of America's scenery into a story with red-blooded plot "puts over" the idea to be conveyed.

Early in the afternoon the expedition arrived at the end of the ice field, in which more than 5,000 steps were cut to insure footing for the heavily loaded movie caravan. Ice picks and alpenstocks were discarded because they are useless on the last thousand feet of sheer climb known as the "final ascent." The angle of inclination here is 80 degrees—so abrupt that, in places, strips of rope were hung over the edge of rocks to afford handholds. The warm sun, which melted supporting layers of ice under overhanging rocks, sent thousands of bowlders of varying sizes—from a thumb to a bungalow—down the slope at awful speed. By crouching under overhanging ledges, death was cheated numerous times while thundering masses of rock poured overhead like black waterfalls.

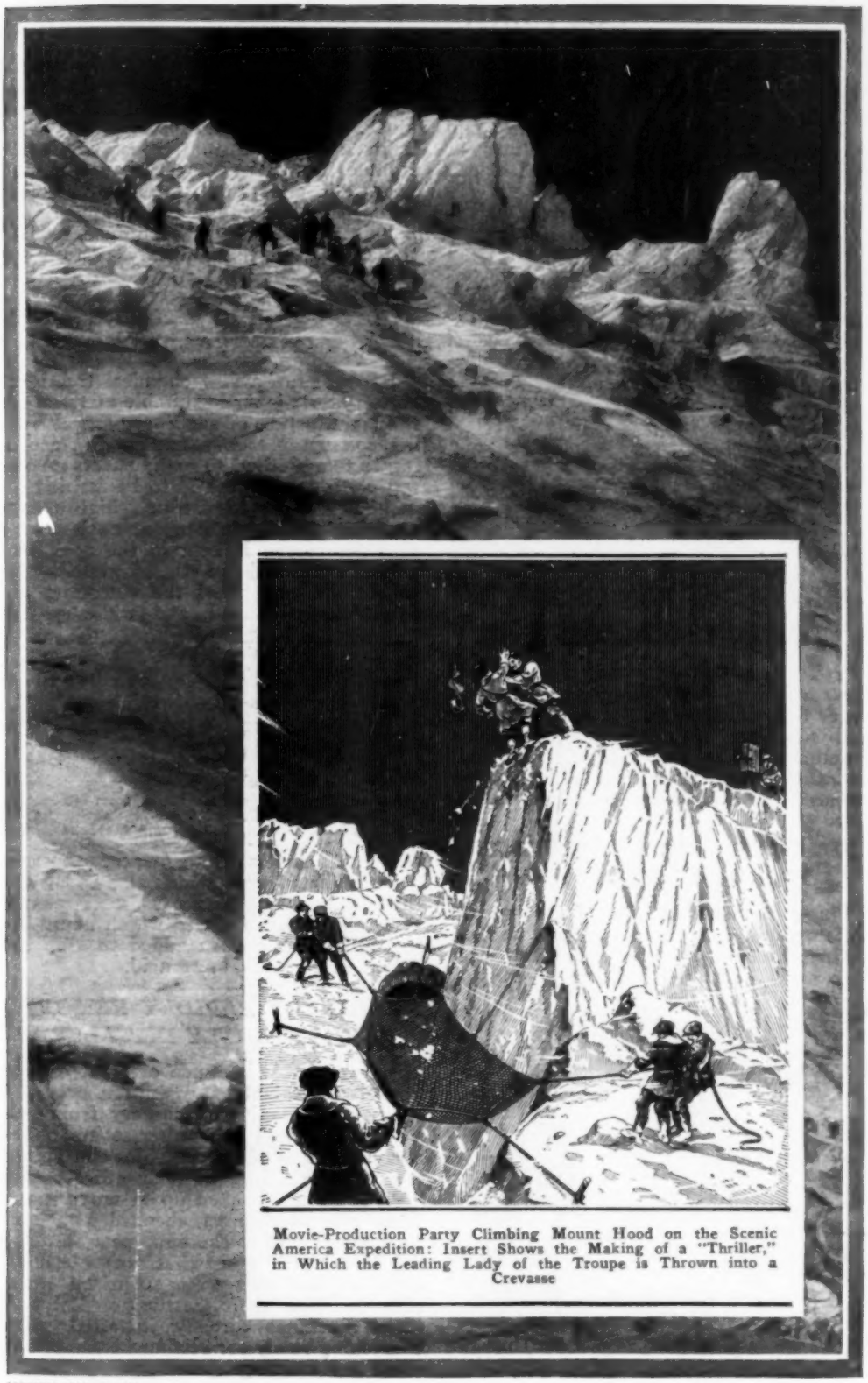
To increase the difficulties of the climb, a snow and sleet storm raged as the expedition reached the top at three o'clock in the afternoon. Every person was fatigued and famished. Food packs had been left at the foot of the ice field, it being thought certain the descent could be made without difficulty. Within a few minutes after the top was reached, the summit and slopes of Mt. Hood were incased in a thick ice blanket, rendering return out of the question.

Through a blizzard that lasted the entire night, and a windstorm that attained a velocity of 50 miles an hour, the party of 15 huddled together, watching shafts of lightning play hide and seek overhead. A tedious and wearying night at last shaded into a lighter though violent dawn. That the climb to the summit might not be for naught, the actors performed their rôles in the raging tempest and recorded a film which is unusual.

A consultation and investigation of the northeast slope revealed the impracticability of descent that way, and it was determined to go down the easier south side. Fatigued and weak from hunger, the troupe marched into the teeth of the storm down the mountain, and in the middle of the afternoon reached a government camp, where food and shelter were obtained. The record of the trip in pictures was perfect, and the hardships of the journey were requited by the fact that a true message had been registered to inform the world that in America are to be found year-round snow and mountain sports the equal of any.

WIDEN OLD HIGHWAY BRIDGES IN PENNSYLVANIA

The widening of over 1,800 old highway bridges, that are less than 16 feet wide, is to be begun next season by the State Highway Department of Pennsylvania. Most of these bridges, some of which are 100 years old, are too narrow to allow the passing of two trucks 90 inches wide, that are permitted to operate under the state law. The new bridges will be at least 24 feet wide.



Movie-Production Party Climbing Mount Hood on the Scenic America Expedition: Insert Shows the Making of a "Thriller," in Which the Leading Lady of the Troupe is Thrown into a Crevasse

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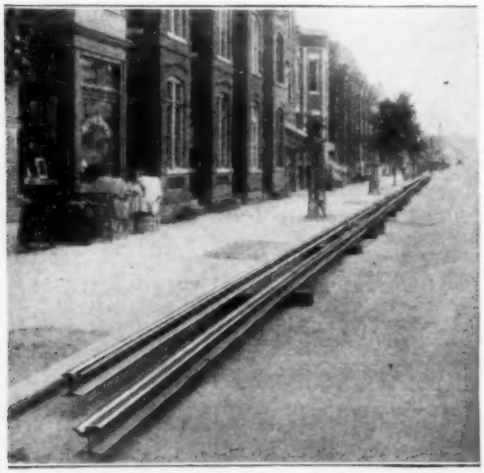
LAYING STREET-CAR RAILS 420 FEET LONG

Rails, 420 feet long, were recently laid on one of the street-railway lines at Washington, D. C. This unusual length

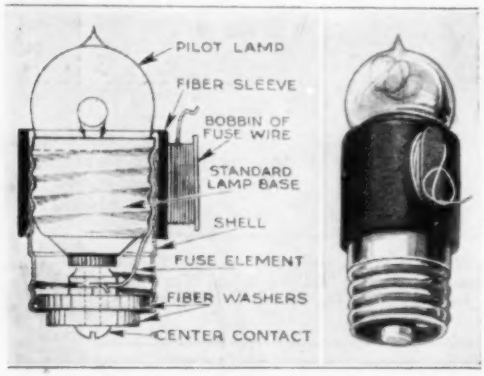


Rails, 420 Feet Long, Made by Welding Together Standard Lengths: They were Laid as Units

of rail was put down during a time when the car tracks were being relaid and, in order to avoid interruption to traffic, several standard rail lengths were welded together during the day. In the dull hours of the early morning the track gang replaced the old rails with the new units.

PLUG-TYPE RENEWABLE FUSE HAS INDICATING LAMP

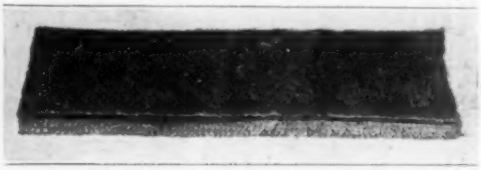
Plug-type renewable fuses, having indicating or pilot lamps, are a protection against annoying delays when using electric irons, washing machines, ranges, vacuum cleaners, and similar household appliances. The fuse is designed to fit in any standard distribution panel or fuse block. When a fuse "blows," its lamp lights, showing instantly just where the trouble lies. Any novice may then unscrew the pilot lamp, insert a new fuse wire, of which a supply is wrapped on a bobbin at the side of each fuse, replace the lamp, and thus quickly restore the interrupted power.



At the Left Is a Sectional View of the Plug-Type Renewable Fuse Which Contains an Indicating Lamp. Right: General View of Fuse

COTTON-FABRIC BELTING MADE BY CHEMICAL PROCESS

By means of a new chemical treatment cotton fabric is made suitable material for the manufacture of such products as belting, conveyors, trunks, and shoes. According to this method as many sheets of cotton cloth as are desired to be formed together, are passed through highly concentrated sulphuric acid, at such a rate that the cotton is kept in the acid only a predetermined length of time. This causes the surface of the cotton to become partly jellified, and while in this



Piece of Six-Ply Material Made from Chemically Treated Cotton Fabric, That Is Suitable for Shoes, Trunks, Belting, and the Like

state, the sheets are squeezed together between heavy rolls which also wring out the acid. The fabric is next passed through a water bath to which neutralizing agents have been added to stop the action of any remaining acid.

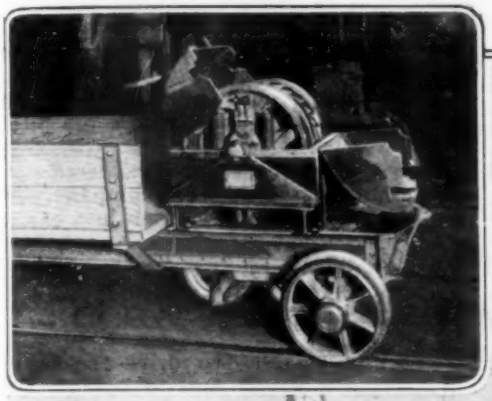
MACHINERY RAPIDLY REMOVED AND INSTANTLY INSTALLED

A remarkable instance of what can be done by systematic preparation occurred recently in moving machinery from one automobile plant to another several miles away. A group of cylinder-block machines were kept running in their old location until the truck backed up to move them. Then the machinists checked out, and took street cars to the new location. The car lines were somewhat tortuous but, even so, the men were surprised when they reached their destination to find their machines already installed, with everything ready for setting up a piece of work and starting operations.

MINE CAR STOPS ON GRADE IF HOIST ROPE BREAKS

By GEORGE F. PAUL

A NEW type of safety mine car has been designed that operates on inclined planes. Tests have shown that, when loaded with from 2,000 to 6,000 pounds of timber and turned over an incline without the hoisting rope, it will stop after running about 30 feet, and also that, if the rope is cut while the car is proceeding up an incline, the car will not recede or back down more than 3 inches.



Above: Safety Car near the Top of Incline, Stopped Automatically after Running 25 Feet with the Hoisting Rope Cut. Upper Left: Side View of Car with Hood Open, Showing Details of Safety Device. Right: Car on Grade with Hoisting Rope Disconnected

The car is brought to rest by the application of brakes to sheaves that are so arranged as to take an effective hold on cables placed within the tracks. The operation of the brakes is governed by the speed of the car. So long as the speed does not exceed that for which the governor is set, the car is free to move in either direction, but the moment this limit is passed, whether through the breaking of the hoisting cable, failure of the hoisting machinery, lack of attention on the part of the engineer controlling the hoist, or any other cause, the car will be brought to rest.

The sheave wheel is a steel casting, which, for the sake of greater safety, is equipped with a pawl and ratchet in addition to the brake. The brake band is automatically actuated through a governor of the fly-ball type.

As typical of what the new car will do in use, may be cited the tests made with one of these cars on the plane of the Amherst Coal Co., at Amherstdale, W. Va. The incline of this mine is 850 feet in length and of considerable steepness, varying from 25 degrees at the bottom to 38 degrees at the top.

The report of one of the state mine inspectors on these tests included the following statements:

"First a short rope hitching was made from the hoisting cable to the car. This was provided so that the rope could be readily severed. The car was hoisted about two-thirds of the way up the plane, at which point the rope was cut. The car traveled back down the hill not more than 3 inches. It contained two occupants, one of whom cut the line. It did not seem to make any appreciable movement when the rope was severed.

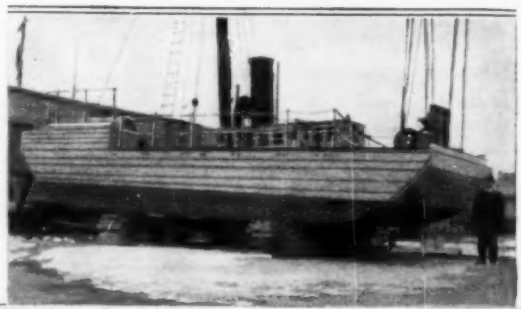
"As a second test, men were stationed on the incline at approximately 100-foot intervals. The car was hoisted to the top of the plane, the hoisting rope was disconnected, and with one man operating the hand brake the car descended the hill, stopped at the different points and picked up the entire party, bringing them to the bottom of the plane.

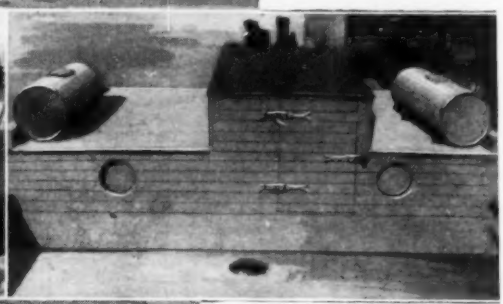
"The next demonstration was conducted entirely at the top of the hill. Two thousand three hundred pounds of dead weight was loaded onto the car; then it was turned loose over the knuckle. This was accomplished in the following manner: A short rope hitching was made as before, this being severed with a knife as the car came onto the steep grade. The car with its load started down the hill, but stopped automatically 25 ft. 7 in. from the top, at a point where the pitch was 35 degrees."

After these tests it was considered perfectly safe to give the coal company permission to carry as many men in a car as it will accommodate.

NONSINKABLE BARGE MADE OF BALSA WOOD

A San Francisco man has constructed a barge of balsa wood which is considerably lighter than cork although it has much greater structural strength than the latter. The balsa wood was obtained from life preservers which were fastened together and the seams filled in with pitch. The barge, which is used mainly for salvage work, is 30 feet long, 14 feet wide, and draws 15 inches of water. Two 30-horsepower gasoline engines are used to drive the barge and to operate the winches. Additional buoyancy is provided by 38 air tanks placed at various points throughout the barge. In the center of the deck a large hole is provided for a winch-operated grappling chain and irons, used in raising sunken objects. Three smaller holes in the deck act as self-bailers for the barge. Individual gasoline tanks for the engines are placed on the roof of the deckhouse.





Top: Nonsinkable Barge Made of Balsa Wood Obtained from Life Preservers, Shown High and Dry on Land. Above: A View of the Completed Barge in the Water

Above: Close-Up of the Deckhouse in the Center of Which the Two Engines are Located. Left: Hole in Deck through Which Grappling Chains are Operated

COMMENT AND REVIEW

[These pages were printed November 27, 1922.]

LIKE a prodigal son at the apex of his luxurious living, our legislators, city, county, state, and national, are appropriating billions of dollars yearly, some of it with apparent disregard as to the necessity of the appropriation, or at least its absolute necessity at the present time.

The Menace of Taxation

It is easy for the army of reformers and advocates of the almost countless improvements—both moral and physical—to offer endless and convincing argument why this thing, and that, is fundamentally good. Few or none of them, in their competition to get legislation favorable to their own pet idea, stop to consider where the money is coming from or how the already overburdened taxpayer is to provide the funds. Many of these objects are admittedly good in themselves, just as a favorite daughter may insist on fur coats and automobiles of a quality and quantity exceeding father's ability to afford. The coats and cars are good in themselves beyond question, but how about father?

Do our governments, city, state, and national, exist to serve the people, or do the people exist to serve the governments? If you have been so busy paying taxes you have failed to realize the giant growing up in our midst, it is worth while to ponder these figures:

In fiscal year 1913-14 taxes were 6.4 per cent of all we earned.

In fiscal year 1920-21 taxes were 13 per cent of all we earned.

In calendar year 1921 taxes were *one-sixth* of our entire national income; and are still going strong. It is too early to determine the figures for 1922, but regardless of this appalling increase in so few years, congressmen are lugging in bills by the armsful for all sorts of excuses to spend millions upon millions on their favorite hobbies.

We are not yet through scrapping war material; we have pensions of the Civil War, Spanish-American War, and the recent war. There is the (at this writing) proposed bonus to soldiers who were uninjured; we have a big war debt and a billion yearly interest on it, all in addition to endless accumulated appropriations of previous congresses to be renewed yearly, and the fast increasing expenses of the necessary departments of the government. At home our state legislators are building stadia and other structures at state universities; there is the natural increase in new buildings to care for the increasing number of blind and insane, the wayward, and all the other state asylums.

It would surely seem that we have reached the point where daughter should be content for a time with what she now has, and not add more furs and cars to father's already crushing burden.

The overbalance of centralized power, even centuries ago, caused the downfall of great and once powerful governments. Federal Judge James H. Wilkerson declared in a recent address that national encroachment on state rights presents a problem to this country as serious as was the issue of the Civil War. The Federal Government should not do for the people of a state what the state can and should do for itself.

The steady and rapid invasion of the Government of those operations which properly belong to the states, and which, with perhaps a few unimportant exceptions, are being sufficiently well done by the states, is simply appalling. Especially is this true in the so-called welfare activities of Federal aid to states. During the past 50 years the Federal payroll has grown until it now exceeds 500,000 officials and employes, or ten times what it was in 1870, while the population in the same period has increased to less than three times what it was then.

The Roman Empire was wonderful and the most wealthy in the world at its height, but Spencer, in reviewing conditions during its decline, says, "So numerous were the receivers in comparison with the payers, and so enormous the weight of taxation, that the laborer broke down, the plains became deserts, and woods grew where the plow had been. It was impossible to number the officials who were rained upon every province and town, who each raised the valuation—as a proof of service done; and so the imposts went on increasing."

Judge E. H. Gary says: "Legislation represents the effort of human beings to promote moral, physical, and property rights and to promote general prosperity. There are two kinds of legislation, prohibitive and constructive. There is the third foolish kind: overlegislation, destructive and interfering. As to overlegislation, so

brilliantly discussed by Herbert Spencer, it has been the curse of nations, the cause of their downfall; it has interfered with liberty and human progress for as many years as we have records."

The greatest fallacy in this country today is that the taxes which come directly out of the "rich" only, are not in fact shared by every other man, woman, and child earning a living, or living without earning, in the entire country, regardless of how small that income may be. The more men the Government employs, the fewer there are left in a productive capacity. The less the production of any necessity, the greater its cost to the consumer.

We do not think to fear the avalanche because it has never yet crushed us, nor the earthquake and cyclone which have never leveled our homes, nor the threat of ultimate taxation beyond endurance; for we have not quite reached the breaking point. The picture seems impossible, but, doubtless, the Romans in their day of prosperity also thought likewise.

Government in Business

THE outspoken position taken by the investment bankers of the country during their recent national convention in regard to Government becoming its own manufacturer of supplies should receive a hearty response from the public. There are some things which require Federal administration. The Post Office Department is one which all governments assume to themselves, but any business man who has studied the proposition knows well enough that a corporation organized to handle, transport, and deliver the mails, would do so more efficiently in many ways, at less cost to the public, and still pay better salaries. Incidentally it would save the yearly appropriation of millions to make up the deficit in that department.

The present proposal to establish government factories for the manufacture of supplies for the Army and Navy, is decidedly a step in the wrong direction, as viewed from all standpoints.

Manufacturing firms and corporations as they exist, have in the past, and unquestionably will in future—if undisturbed—by reason of their active competition, guarantee a larger, better, and more efficient production of government supplies, and at a vastly less cost to the taxpayers than can possibly occur in Federal factories.

Railroads are not suspected of paying any more than they can help for their supplies, yet how few of the thousands of articles they buy are made by any railroad. Car wheels furnish a ready example; the roads and car builders consume practically all the car wheels made, yet less than one per cent of all these wheels are manufactured by the users.

The almost tragic demonstration of what the Government did, and particularly did not do, when it undertook to manage the railroad systems of the country, should suffice as an object lesson for at least a century. "The railroads," to quote the opinion of one of the highest operating officials of a well-known major road, "will not recover their previous morale and state of trained efficiency in a quarter of a century."

During the course of each year there actually are few, if any, articles which are bought to use in stores, factories, and homes, either for ordinary or extraordinary requirements, which do not appear upon the vouchers of every good-sized railroad. The roads however realize they cannot make these things as cheaply, for the same quality, as the manufacturers who specialize in these multitudinous articles. It is only the Government which can afford (!) this waste, with a nation of taxpayers to stand the inevitable loss. Not only is the effort of the Government to go into the manufacturing business a vicious one, but it kills competition and equipment and organization to produce, so that when the emergency comes and vast supplies are wanted on the instant, the Government would find itself limited for a time to what its own factories could turn out.

A few years ago, a successful business man offered to give whatever bonds the Government required to insure perfect performance; to save the annual appropriation to cover the deficiency; and to pay the Government the sum of $5,000,000 each year for the concession of handling the mails; and to do all this without increasing the rate of postage on any class of mail.

Does anyone doubt that an organization of bankers could and would collect the income taxes at vastly less cost than the revenue department does now? If

all the banks spent as much time as the Government takes to collect an equal number of millions, they would either have to give up collections or increase the charge several times.

Examples can be multiplied until all the pages of this magazine would scarcely contain the first chapter. One easily and quickly grasped is a comparison of the telephone in this country and abroad. Here we have 12.4 phones for every 100 people and these are managed by a big corporation, which provides the best telephone service in the world; and voluntarily improves it constantly.

The average in Europe is only 1.2 phones to every 100 people. France, where the telephones belong to the government and are operated by its post-office department, has for two years imposed a penalty charge of 700 francs for each application for a new phone to be put in, for the express, and admitted, purpose of restricting the number of users—government inability to manage what had become—for it—an unwieldy function.

Our Government, undoubtedly, would not do quite as badly, but even in the earliest days of telephone exchanges here, it was never necessary for the little companies which were organized at the start, to impose such penalties, or even any at all, in order to hold back service and progress.

In 1850, Herbert Spencer wrote: "A function to each organ, and each organ to its own function, is the law of all organization. To do its work well, an apparatus must possess special fitness for that work; and this implies unfitness for any other work;" also, "In assuming any office besides its essential one, the state [Federal government] begins to lose the power of fulfilling its essential one."

Just now a lot of congressmen entirely without personal experience in the management of any large operation, or even a small one, seem obsessed with the idea of committing the Government to managing all sorts of things which are being satisfactorily managed by the states. While this opens doors to thousands of political appointments, it would crush the public as direct or indirect taxpayers.

As a matter of economy and efficiency it would be better and cheaper to even subsidize private concerns—which of course is absolutely unnecessary—than to undertake to do such work itself.

With the exception of some secret process which it must guard, there is so very little in favor of the Government making supplies which private firms and corporations can produce, that any step in that direction should be met with a storm of disapproval from one end of the country to the other.

The Tide Turns

DURING the year 1921, it cost the railroads of this country $1,250,000 for accidents where automobiles and trains collided. In only a comparatively few cases were the railroads unquestionably to blame. The overwhelming majority were due to inexcusable carelessness on the part of the drivers of the automobiles. Railroad trains are large and noisy, they can be seen and heard usually a considerable distance away. In most states, certainly in all the densely settled ones, in addition to the regulation danger sign maintained by the railroads, there are similar signs usually set several hundred feet from the crossing warning autoists to exercise caution in approaching the track. At other points are gatemen; flashing red lights; warning bells. The engineer seldom fails to sound his whistle warning at a safe distance, and the locomotive bell rings. In spite of all these precautions grade-crossing accidents are multiplying rapidly, and the loss of life is appalling.

People seem regardless of danger, or become so occupied in conversation they are unconscious of it. The chief of the accident-claim department of a very large road, told me of one such, which occurred recently.

A long freight train was nearing a country highway, at not over 18 miles an hour, over a level track. It was a bright sunny day. The locomotive and several cars had already passed over the highway, when the conductor and one brakeman looking out the cupola window, saw an open car approaching at rapid speed and fully a half mile away. The highway was also level and there was nothing whatever to obstruct the view from either automobile or train. The auto approached without in the least slackening its speed, and struck the second freight car from the rear end of the train. The auto was a complete wreck, but its four male occupants escaped permanent injuries. Their explanation was they underestimated the length

and speed of the freight train and didn't think it was worth while to slacken speed, much less stop, as they expected to shoot across just behind the caboose.

The railroads have borne without much complaint the burden of such accidents all these years, but the tremendous increase in the number of cars, and apparently, in the carelessness of their drivers, has reached a point where they may be expected to react. In other words, the worm is beginning to turn.

We have evidence of this in a recent court decision, where a driver sued the Pennsylvania Railroad for damages to his car, which plainly resulted from his having carelessly run into a fast passenger train. The railroad sued the man for damage to its gates, which were proved to be down, and through which the car crashed because its driver failed to reduce his speed.

The case is interesting as the first of its kind, and as the prospect is that other roads will likely follow the same course, it evidently behooves the driver of an auto to stop, look, and listen, and have his car under control before he decides to run down the cannon-ball flier or even a way freight.

H. H. WINDSOR

ANCIENT POTTERY METHODS STILL IN USE

By D. C. RETSLOFF

LONG before white men peopled America the Cliff Dwellers, in what is now known as New Mexico and Arizona,

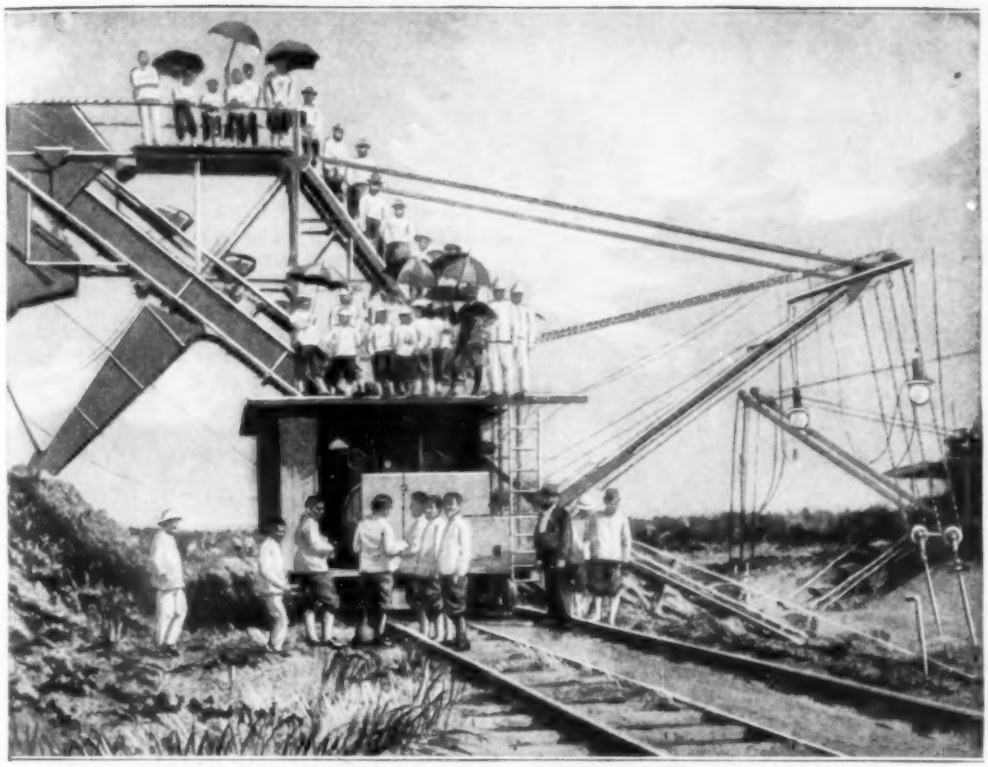
Earthen Vessel in the Process of Manufacture, Showing How the Base is Molded Inside of a Mortar and the Top Shaped by Hand

made pottery vessels from clay. Their art, by lessons and by word of mouth, has been handed down from generation to generation, and among the Mexicans and Indians of the southwestern part of the United States are found many expert pottery artists. Earthen vessels of all sizes are being made today in southern California, and the manufacturing process is largely the old-fashioned one. Both men and women do the work and display with pride the articles they create.

"Ollas," as most of the vessels are called, are used as receptacles to hold water, food, or grain, although it is not uncommon to see some highly decorated ones set aside as purely ornamental. Many of the common ollas have the favorite ovolo molding at both base and lip. Others are broad at the base and taper to a slender neck. If a colored design is put on an olla, the work must be executed with great rapidity. The clay absorbs the colors very quickly and if a line is interrupted, the joining is quite perceptible.

The material is cheap, but the good workmanship of the artist makes the olla handsome and in some instances expensive as well. Frequently the clay is kneaded by barefooted workmen. After it has been properly worked up, the olla is shaped by hand. The final smoothing of both outside and inside is done with a piece of chamois wrapped around the workman's index finger. A mortar, cast at the base of the olla, is used to shape the lower half, the upper part being built without any support whatsoever. Small ollas, however, are molded without any casts and are turned out in great numbers by expert potters.

After the molding is done, the vessels are left to dry in the sun for several days, and then baked in a kiln like common brick.

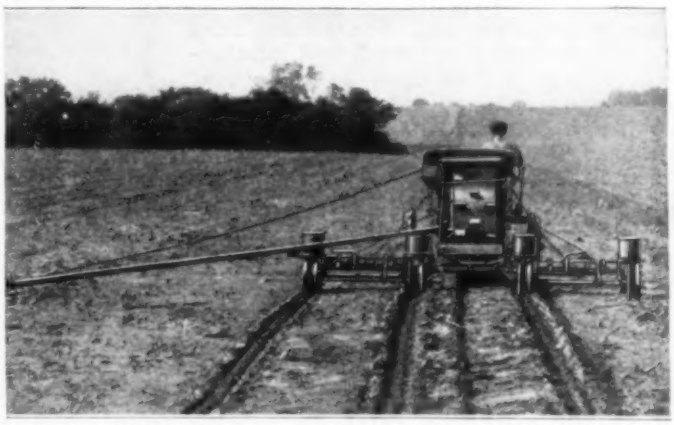


MODERN ROAD-BUILDING EQUIPMENT ADOPTED BY SIAM

MODERN road-building equipment has been adopted by the government of Siam as a consequence of a recently conducted campaign for the betterment of that country's highways. The accompanying picture shows one of the mammoth dry dredgers which have been put in operation lately. The King of Siam and members of his official family attended the elaborate dedication ceremonies. This dredging outfit will remove approximately 250 cubic yards of earth in an hour and is operated by a gasoline engine.

CORN LISTER PLANTS FOUR ROWS AT ONE TIME

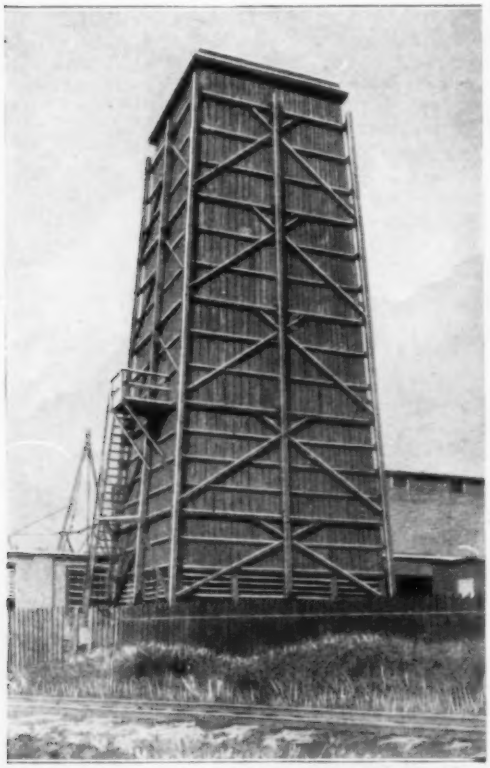
Planting, or listing, four rows of corn at one time, is achieved by a Kansas farmer who has thus practically doubled his efficiency during the planting season. His machine is a combination of two corn planters. Taking the drivewheels from a pair of these implements, the farmer attached them to a hitch crossbar behind a small tractor. When the grain is placed in the ground, it is not crosschecked, so that the speed of the outfit may be greatly increased over that attained by the customary corn planter. The arrangement is so simple, and so cheaply contrived, that other interested farmers could easily try it.



Corn Lister Which Plants Four Rows at One Time: The Speed of This Machine, When Crosschecking is Eliminated, may be Greatly Increased over That Obtained When Using an Ordinary Planter

ICE-HOUSE CONDENSER BUILT OF CREOSOTED TIMBER

To avoid the costly upkeep of steel ice-house condensers, a New Jersey company has built a condenser out of creo-



Ice-House Condenser Built of Creosoted Timber: It Is 32 Feet Square at the Open Lattices of the Base, 78 Feet High, and 27 Feet Square at the Top

soted timber. The structure is 32 feet square at the base, 78 feet high, and 27 feet square at the top. The wooden sides of the condenser are solid and substantial, with a tier of open latticework at the bottom, and an opening at the top, so that a current of fresh air rises continuously through the condenser, helping to cool the water that flows from top to bottom of it, and is then forced to the ammonia condenser on the top floor of the ice house by a pump with a capacity of 1,000 gallons a minute.

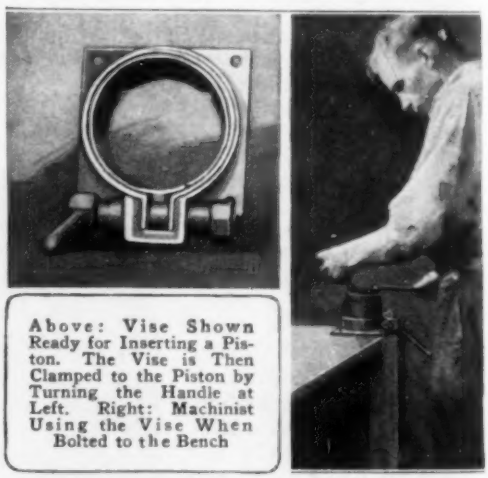
¶ Nungesser, French flying ace in the late war, is reported to be building a large egg-shaped airplane, which experts declare will make 250 miles an hour. It will be a 700-horsepower monoplane with wings forming a forward-opening "V" with an angle of 120 degrees.

TICKLESS CLOCK OPERATES ON NEW PRINCIPLE

A clock that is tickless, because it operates without the usual lever, was one of the specimens recently exhibited by a German scientist in demonstrating, before a group of scientists and other interested persons, a new form of energy transformation. By this principle, which he discovered while studying the manner in which oscillating radio currents transmit energy to one another, energy of motion in one direction is converted directly into energy of motion in another direction, and the waste energy such as occurs in reciprocating machinery is eliminated. It is said to promise many important results when applied to high-speed engines, airplanes, the propulsion of ships, and other energy-utilizing devices.

GAS-ENGINE PISTON VISE FOR USE IN GARAGES

Intended specially for use in garages and repair shops, a gas-engine piston vise has been devised that can be adjusted to hold pistons of different sizes rigidly and in any position. The vise is of the circular type, and is clamped to the piston by means of an annular interior spring with an equal pressure on all parts of the piston. This spring is closed up by turning with its handle a shaft that operates in a U-shaped lateral extension of the clamp. Flanged to one end of the clamp is a square plate that is drilled for bolting to a workbench or any other support. The



Above: Vise Shown Ready for Inserting a Piston. The Vise is Then Clamped to the Piston by Turning the Handle at Left. Right: Machinist Using the Vise When Bolted to the Bench

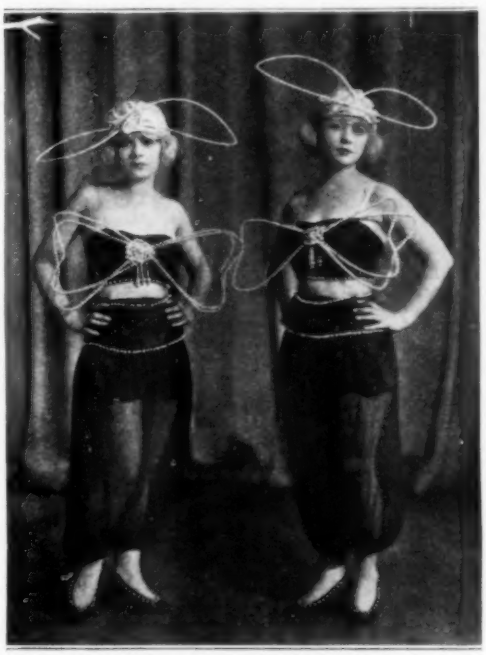
clamp can be used on small pistons by inserting a smaller spring bushing in the clamping spring.

Prima Donna and Members of the Pearl Ballet Shown at Their Respective Stations on the Stage Just Before the Lights are Extinguished: Note the Black Costumes of the Ballet, and behind the Performers, the Black Stage Hangings, Both of Which Bring the Pearl Trimming Out in Clear Relief

PHOSPHORESCENT JEWELS FOR PEARL DANCE

By H. A. LANE

ONE of the most remarkable sights ever presented to a theater audience is the display of luminous pearls on the gowns worn by a prima donna and 10 ballet girls of a musical comedy. The pearls are used in a scene as a climax to a "pearl song" rendered by the prima donna. For this scene, the stage hangings are black and the costumes of the ballet are also of a black material. As the singer completes her number and retires into the wings of the stage, the ballet girls appear in their pearl-bedecked gowns. The prima donna then reappears for an encore, and the lights are suddenly extinguished.



Beautiful "Pages" of the Pearl Ballet, Who Carry the Prima Donna's Train: Although These Girls Wear Fewer Pearls than Any of the Others, the Silhouette of Their Glowing Jewels Is Just as Startling, as may be Seen in the Picture at the Bottom of the Page

The audience is amazed as it sees nothing in the blackness except the designs and figures on the costumes, the pearls standing out in clear relief with a greenish-white glow. Neither the faces nor the arms of the performers are visible as they stand in the darkness, moving slightly to and fro to heighten the effect. When the encore is finished, the lights are switched on and the scene assumes its natural aspect, nothing strange being seen in the costumes as the curtain shuts them from view.

A glimpse behind

Amazing Silhouette Picture Produced When the Lights are Extinguished, Leaving Only the Glowing Pearls Outlined against the Blackness of the Costumes and Stage Hangings: To Heighten the Effect, the Ballet Members Sway Slowly To and Fro, Causing the Phosphorescent Jewels to Undulate in the Darkness

the scenes some 45 minutes before this "pearl" number is put on, however, reveals the caretaker of these costumes gingerly removing them from a specially designed trunk. The trunk is thickly padded with cotton to prevent damage to the pearl-trimmed dresses, which contain 250,000 pearls of various sizes and are insured for $100,000. After the gowns are removed from the trunk they are hung on the wall of the dressing room, and a battery of powerful arc lamps is trained upon them. For 20 minutes they are subjected to the dazzling glare of the lamps, while the attendant painstakingly arranges and turns them so that each part will receive a full share of the illumination.

At the end of this period, the ballet girls appear and don the costumes. Then, with their eyes protected by black goggles, they, too, stand in the brilliant light, slowly turning round and round before the lamps, awaiting their cue to enter the stage.

In the meantime, the pearls on the gown of the prima donna must also be bathed in light, and this is accomplished by throwing spotlights upon her as she renders the song number. Thus, while the audience is listening to the song, it does not realize that the spotlights are, during those few minutes, being used for a double purpose.

The bathing of the pearls in an intense light serves to revivify or invigorate a peculiar pastelike preparation with which they are filled, so that they will radiate a glow for approximately 15 minutes after being removed from the light. The paste, which is a combination of calcium sulphide, calcium fluoride, barium sulphide, and other ingredients, is the product of a French inventor. The quarter million of paste-filled pearls were delivered in bulk to the producers of the show in this country, who employed garment manufacturers to string them upon linen cords, similar to fishline, and trim the costumes. While this phosphorescent product is not a discovery, the adaptation of it in this particular instance is a departure from ordinary uses, the presentation as a whole being a thing of charm and beauty.

HOMEMADE CORN HARVESTER RUN BY ONE MAN

A combination corn picker and tractor, that harvests and loads 10 wagons with corn in 10 hours, has been made by an ingenious farmer of the middle West, who built the machine from parts of automobiles and other equipment purchased from secondhand dealers. The harvester is surmounted by a large box into which the corn is hoisted from the pickers by an elevator. When the box is filled, the machine is moved over to a wagon conveniently located and the contents emptied. The machine is of simple construction and is said to work smoothly and economically. One man can without difficulty operate the tractor and manipulate the corn-harvester equipment.

This Homemade Combination Corn Picker and Tractor Harvests and Loads 10 Wagonloads of Corn in 10 Hours, and is Operated by One Man. It is Built from Parts of Automobiles and Various Other Equipment

DREDGINGS FROM MOBILE BAY TO MAKE MOTOR HIGHWAY

Dredgings from the navigating channel of Mobile Bay, in Alabama, are being deposited along its eastward side, with the intention of ultimately using the thus formed new land as the foundation for an automobile drive. The proposed highway will extend from Mobile to Fort Morgan, situated at the mouth of the bay, and will have a length of 30 miles. An enormous amount of sand and mud is washed down from the Alabama river system every year. This is dredged out by the government, to maintain the necessary 30-foot depth in the channel, in such quantities that sufficient material will soon be on hand to permit the beginning of the roadway.

FILMING A BUFFALO STAMPEDE

By FRED. A. HERR

A HEAVY redwood barricade, filled with sand and earth to offer greater resistance to the onrushing horde of buffaloes, was the means employed recently by a company of film folk to cause and portray a wild-buffalo stampede. Entrenched behind it, with the cameras is the last of the large herds surviving in America. This island, also known as Buffalo Island, was leased by the motion-picture company for the filming of the picture. Many of the stunts were in the nature of the common events of a motion-picture star's life. But even the most

"A heavy barricade filled with sand and earth . . . was used to cause and portray a wild-buffalo stampede. . . . Even the most blasé performers watched with open-mouthed awe, as the herd of buffaloes thundered by the stockade. It recalled to their memories how the sturdy pioneers had encountered these maddened beasts when the red man and the monarchs of the plains roamed the western land."

gleaming over the top of the breastworks like the batteries on the banks of the little Somme River in France, the motion-picture troupe witnessed one of the most spectacular scenes ever staged for the industry.

A wild-eyed, bellowing, charging mass of buffaloes, enraged by a many miles' journey over rough country roads, to be used in the filming of episodes from Emerson Hough's story "The Covered Wagon," were stampeded past a battery of four cameras on Antelope Island, near Salt Lake City, Utah. The herd comprised approximately 10,000 animals and blasé performers watched with open-mouthed awe, as the herd of buffaloes thundered by the stockade. It recalled to their memories how the sturdy pioneers had encountered these maddened beasts when the red man and the monarchs of the plains roamed the western land.

The barricade was 8 feet high, built in the form of a triangle, with the apex facing the direction from which the picture was to be taken. California redwood timbers, 10 inches thick, were driven into the ground in the manner of the old-time stockade. The interior was filled with sand and earth, to solidify the structure

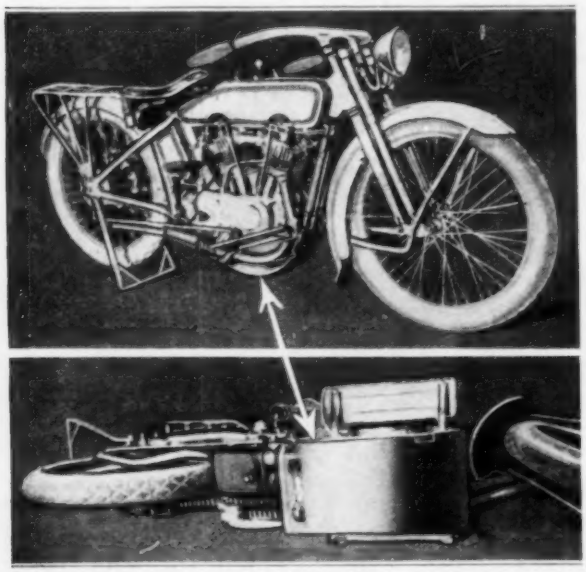
and lend more resistance should the animals charge the stand. The rear was painted to resemble rocks. Atop was placed all the material used in the scene. A dozen actors, the directors, and the camera men likewise occupied seats on top of the barrier.

From this were first filmed individual scenes. Small herds were driven up, and into them plunged the actors afoot or on horseback. To film the grand finale, all the animals on the island were rounded up and driven to a point several miles east of the platform. A small hill intervened, so that the stampeding herd could be filmed as it mounted the horizon with manes flying, and charged full tilt down the hillside toward the stockade.

Sitting in their assigned positions, the camera men and directors were eating lunch when the advance guard of the herd appeared on the hill to the east. The leaders of the herd swept over the top and charged in a surging mass straight for the stockade. From the barricade the cameras were in action, shooting the maddened herd as it tore onward, leaping and rearing. Charging forward, the herd seemed to make straight for the platform. A short distance beyond the stockade it veered to the left and disappeared over the brow of the distant hills.

NEW GUARD FOR MOTORCYCLES CLAMPED UNDER ENGINE

A metal plate for motorcycles, which acts as a guard against pebbles picked up from the road by the front wheel and thrown backward, is one of the latest improvements in this field. The device consists of a broad arch-shaped plate extending beneath the motorcycle frame from the front footrest bar to the muffler. Clamped close to the frame, it protects engine and rider from stones, serves as a means of gliding over obstructions on the road surface, and with the added weight tending to lower the center of gravity, makes balancing less difficult.



Above is Shown How the Metal Plate Curves under the Engine, Protecting It from Loose Pebbles. Below Is a Bottom View of the Guard, Showing Its Ample Width

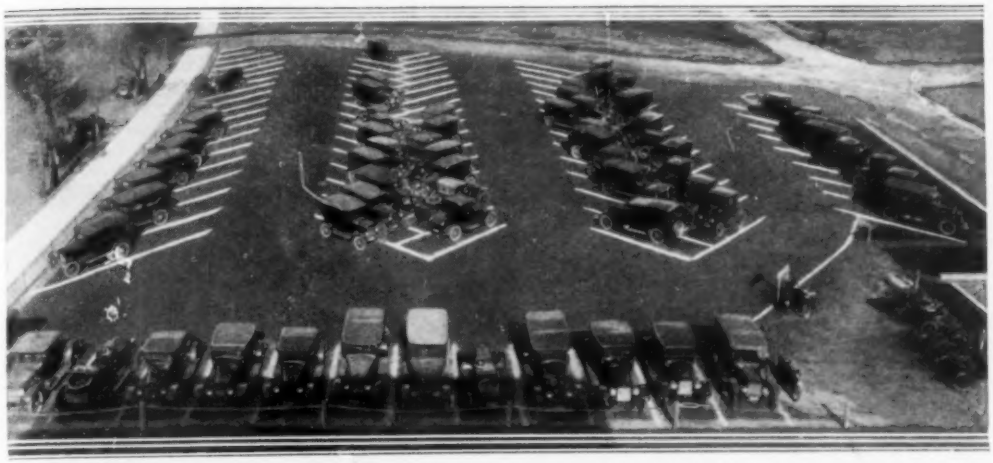
CAVALRY BOARD DEVELOPING PACK COOKING OUTFIT

The U. S. Army Cavalry Board has been experimenting for several years to develop a suitable pack cooking outfit for troopers, an article recommended as necessary by practically every officer who witnessed the disadvantages of individual cooking, when in the Mexican campaign the men were separated from their field ranges.

Of a number of designs submitted, all have been dropped for one reason or another, after test, except the one receiving consideration at present. It consists of two side loads for a packhorse, each load containing a number of boilers, bake pans, and kitchen utensils, nested in two fire frames which can be hooked together to form a container for them.

The outfit is simple and, except for the fire frames, contains only articles already issued by the quartermaster corps. The weight will not exceed 200 pounds, including pack saddle or aparejo, to which the outfit can be lashed. It is now undergoing a field test, upon conclusion of which, if the report is favorable, it is proposed to develop suitable hangers to avoid the necessity of using lashings, which are an inconvenient form of fastening.

¶A simple compound is reported to have been perfected that counteracts the effectiveness of poison gas, and the French government has provided funds for the manufacture of 35,000 pounds of the chemical.



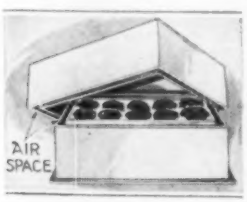
System of Parking Automobiles at the Massachusetts Institute of Technology: Any Car can be Backed Out Readily from the Spaces Outlined in White for Them upon the Gravel of the Parking Yard. To the Right Is the Space Specially Reserved for Motorcycles with Their Sidecars

ANY CAR EASILY REMOVABLE IN NEW PARKING SYSTEM

At the Massachusetts Institute of Technology, at Cambridge, many of the students have automobiles, and a system of parking them has been evolved by which any car can be driven away quickly at any time of the day. For each car a space is outlined in white upon the gravel of the yard reserved for parking. These lines are laid out at an angle so that a car can be backed out readily from its berth into the ample space that is left between the rows of cars. A separate space is reserved for motorcycles.

CHOCOLATE SAVED FROM HEAT BY AIR-INSULATED BOX

For the purpose of packing chocolate so that it will resist high temperatures during shipment to tropical countries, a container has been devised on the principle of the vacuum bottle. Although ordinarily chocolate will melt, or at least become soft, at a temperature of 90°F., in these boxes it remains hard at as high as 120°. The boxes are rectangular and telescopic, similar in construction to the baggage carriers once so universally known as "telescopes." Inside the outer box is a similar one in both halves of the telescope, these smaller ones fitting together in the same manner as the larger ones, and leaving a space, about ¾ inch wide, between the two on all sides. Air is a poor conductor of heat, and this air space all around the container forms a good enough insulation to keep the heat from reaching the chocolate.



SIMPLE "FOUNTAINS" BUILT ALONG CALIFORNIA ROAD

Motorists over the recently completed Gaviota Pass road in California are delighted to find that the road builders paused for a moment at each natural spring they encountered along the road, took a few shovelfuls of concrete from the mixture they were laying for the road foundation, and fashioned a rude basin for the water from the spring. The water is cool and refreshing, and also furnishes a convenient source of supply when it is desired to refill the radiator.

One of the Crude Basins Built around Natural Springs along Gaviota Pass Road in California

MONUMENTS IN VARIOUS PARTS OF THE WORLD

Monument to John Howard Payne, Author of the Words of the Song "Home Sweet Home," Erected by the Old Guard of Atlanta, upon the Site of the House of Chief Van, of the Cherokee Nation: Here Payne was Imprisoned on Suspicion of having Incited the Indians to Revolt. He was Found Not Guilty

Memorial to James Orton, the American Explorer, on Esteves Island in Lake Titicaca

Memorial to First Settlers of Blooming Grove, Illinois, Erected on Site of Its First Log Cabin

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Memorial to Eugene Field, Poet Beloved by Countless Children, Erected in Lincoln Park, Chicago: The Front Group Illustrates His Most Famous Character, "Little Boy Blue," in the Land of Nod

TO HEROES IN MILITARY AND CIVILIAN LIFE

Plaster Cast of a Heroic Statue of a Canadian Soldier, Designed by a Noted Canadian Sculptor, and Sent to a Seattle Foundry to be Cast in Bronze: The Statue will be Erected in Vancouver, British Columbia, in Honor of the Soldier Dead of the Dominion

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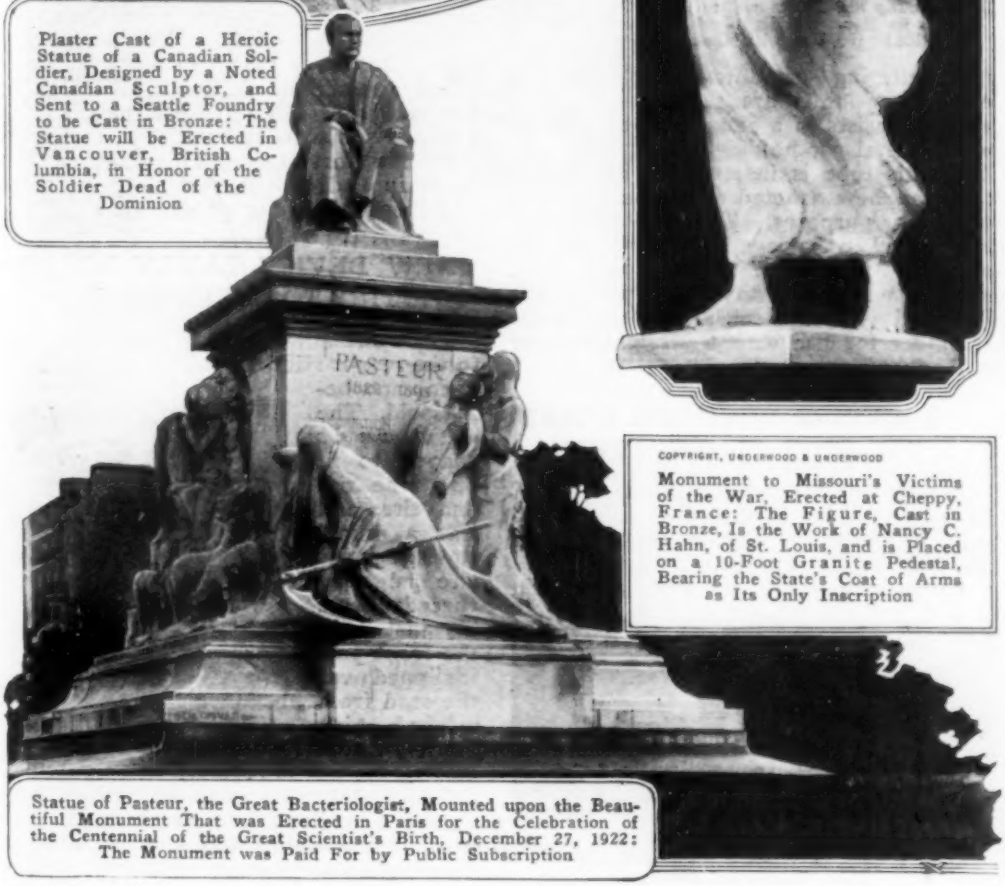
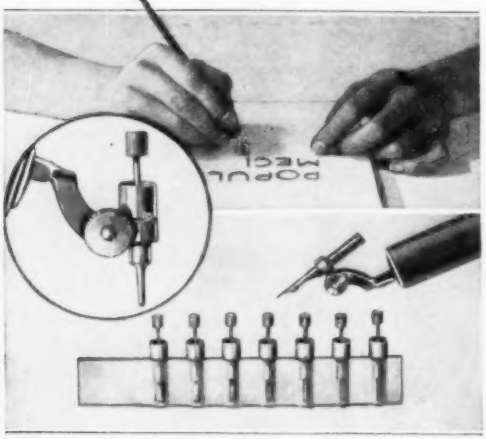
Monument to Missouri's Victims of the War, Erected at Cheppy, France: The Figure, Cast in Bronze, Is the Work of Nancy C. Hahn, of St. Louis, and is Placed on a 10-Foot Granite Pedestal, Bearing the State's Coat of Arms as Its Only Inscription



Statue of Pasteur, the Great Bacteriologist, Mounted upon the Beautiful Monument That was Erected in Paris for the Celebration of the Centennial of the Great Scientist's Birth, December 27, 1922: The Monument was Paid For by Public Subscription

INSTRUMENT SETS THAT HELP IN RULING AND LETTERING

Neatly packed in a small case, a combination of drawing instruments adapted to facilitate fine lettering, is now on the market. For drawing inked lines

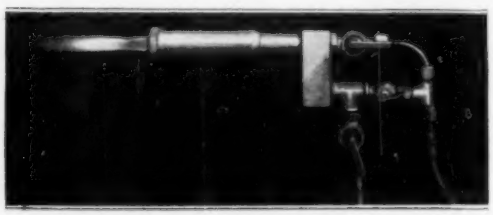


Seven Ruling Pen Points and, in Inset, One in Socket Ready for Use: To Right and Above, the Socket is Shown in Use with Ordinary Pen Point

and lettering of different thicknesses, eight pen points are provided, each of which consists of a small pointed tube of white metal for holding a supply of ink. Into this tube is inserted an ink feeder that can be extracted from the tube for cleansing purposes. The pen point fits into a socket that can be attached to any ordinary penholder. This socket can also be used with any small pen point. Included with each set is a line-ruling instrument for use with a straightedge or a T-square.

GAS BURNER WITH AIR BLAST GIVES HIGH TEMPERATURE

A new gas burner has been designed to overcome the necessity of using oxygen in working "high-melting" glasses and metals. It is said to maintain easily a flame temperature of over 3,000° F., with either natural or artificial gas under a pressure of 2 to 4 inches of water, or with an air blast of 3 to 5 pounds pressure per square inch. The burner will operate efficiently in any position, and by manipulating the control valves, a wide range of flame temperatures is possible, as is also an oxidizing or a reducing flame. Another feature is the change in the width of flame made possible by a sliding sleeve on the barrel tube.



New Gas Blast Burner, Designed to Eliminate the Use of Oxygen in Working "High-Melting"-Point Glasses and Metals

SCRAPPING IRON AND STEEL WITH EXPLOSIVES

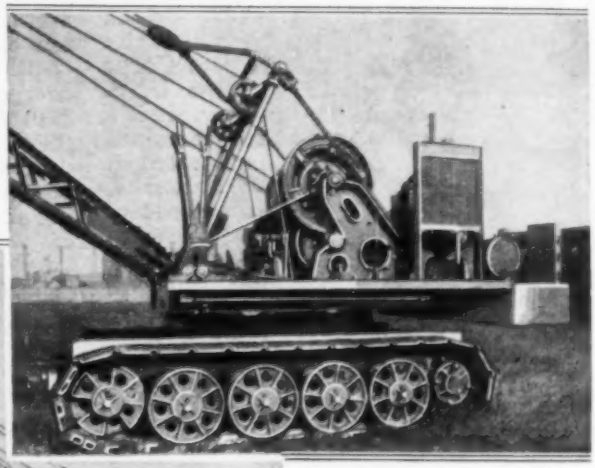
In scrapping iron castings or steel plates by means of explosives, such as dynamite, various methods are being used in England. The cartridges are made by covering with compressed clay a charge of the explosive. In the case of cast iron, which is most easily fractured by shock, a number of these cartridges are placed together at the strongest part of the casting. In the case of a steel plate, which is most easily fractured by a cutting or shearing process, the cartridges are placed end to end in a line across the plate. In heavy cast-iron blocks, a hole, about an inch in diameter, is drilled to the center of the strongest part of the casting, is then chambered out, and filled with the cartridges. This method has been applied to the scrapping of ships and the demolishing of wrecks.

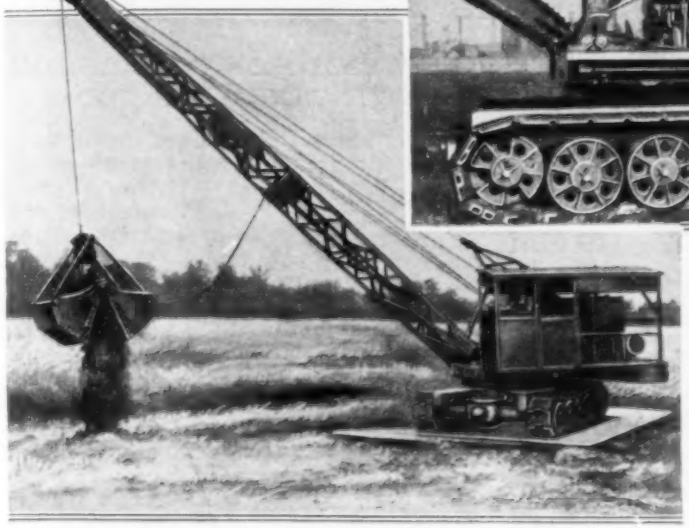
NEW DEVICE EASILY LOCKS TIRE TO CARRIER RIM

The spare auto tire may be easily locked to the rear carrier rim with a hinged steel clamp now being sold. The device is shaped to fit the tire rim and tire, and has a small opening for the regular threaded stud. To install it, the front part is slipped over the stud from which the original nut and rim wedge have been removed, the nut is replaced and tightened, the hinged band swung into place, and finally, a padlock hooked through both ends of the clamp and a small bracket mounted on the carrier rim.

NEW CRAWLER-TYPE CRANE OPERATES IN SWAMP

A crawler type of crane, recently placed on the market, has distinctive features in its design that apparently account for its performance in constructing a new road through a swamp. In this instance it operated from large wooden floats which were moved ahead as it advanced, although ordinarily it will run wherever the ground will sustain a weight of 10 pounds to the square inch. The rear axle is built around a hollow steel casting, as in automobile practice, and the front axle is also a steel casting. It is operated by one man and regularly equipped with a gasoline-engine driving unit, that uses kerosene equally well, but electric-motor or steam-engine drive is furnished when desired.





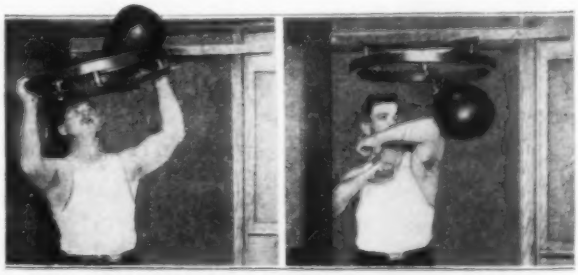
Above: New Crawler-Type Crane That Has a Capacity of 10 Tons at a 12-Foot Radius and 3 Tons at 30-Foot Radius. Left: Crane Mounted on Wooden Floats, Building a Swamp Road

NOISELESS PUNCHING BAG FOR APARTMENTS

For a long time a serious problem has confronted apartment dwellers who desired to take their physical culture via the punching bag. In the general type of such an outfit, noise and vibration would bring protest—and often worse—from other tenants, while defacing of walls or woodwork necessary to securing it in place, is out of the question.

The problem has been solved with an "apartment" punching-bag platform free from vibration and noise. Its construction is such that it fits any doorway of standard dimensions, being held firmly in place without screws, bolts, or nuts, and padded with felt where it touches any woodwork. It is adjustable to any height for use by a child or grown-up, and can be put into place and rigidly secured in less than one minute, and removed as easily.

The platform has a spring shock-absorbing equipment and all the practical features required by the bag puncher. It is neat in appearance, made of seasoned stock in fumed-oak finish, and all metal parts are nickeled.



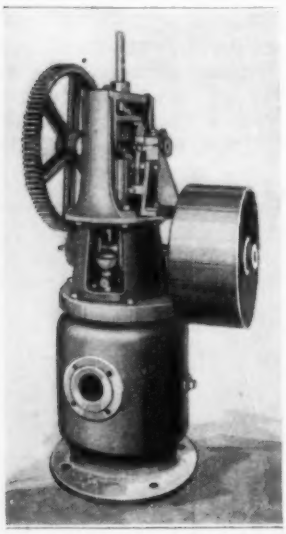
Left: Noiseless Punching-Bag Platform That Fits in Doorway without Marring Woodwork and is Quickly Put Up and Removed. Right: Punching-Bag Holder in Use

HAND-CRANKED GENERATOR USED IN FIELD RADIO

A hand-cranked electric generator has been developed for field service in connection with radio-pack sets of the Signal Corps of the U. S. Army. It is a self-contained unit, rated at 250 watts, and, at a speed of 3,333 revolutions a minute, will generate a 500-cycle current. The crankshaft, which is intended to be turned by a pair of cranks at a speed of 33 to 50 revolutions a minute, is back-geared 100:1 to the armature shaft, which carries a flywheel for smooth running. It is arranged to be mounted on a collapsible four-legged stand.

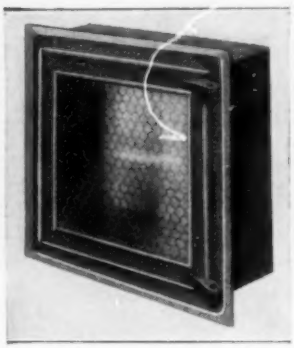
VALVELESS SUCTION PUMPS OF NOVEL TYPE

For air, gas, water, and viscous fluids, a type of reciprocating pump that is entirely valveless, and that is claimed to possess the highest possible cylinder efficiency, is now being manufactured in England. The body of the pump is in the form of a cylindrical casing, which has a fixed pistonlike head at each end, with an annular clearance between its outer rim and the inside wall of the casing. On the upper head is a stuffing box through which passes a rod that operates the reciprocating plunger. This is in the form of a cylinder, open at both ends and divided into equal compartments by a diaphragm at its center, to which the plunger rod is connected. The reciprocation is done by means of a crankshaft mounted above the casing, and in connection with which are means for rotating the plunger at the end of each stroke. The purpose of this rotation is to close the inlet and discharge ports in the plunger that register with corresponding ports in the casing, these being open respectively during the up and downstrokes. The skirts of the plunger pass between the wall of the casing and its fixed heads during the reciprocation.



NEW CAST-IRON COAL CHUTES WITH WIRE-GLASS DOORS

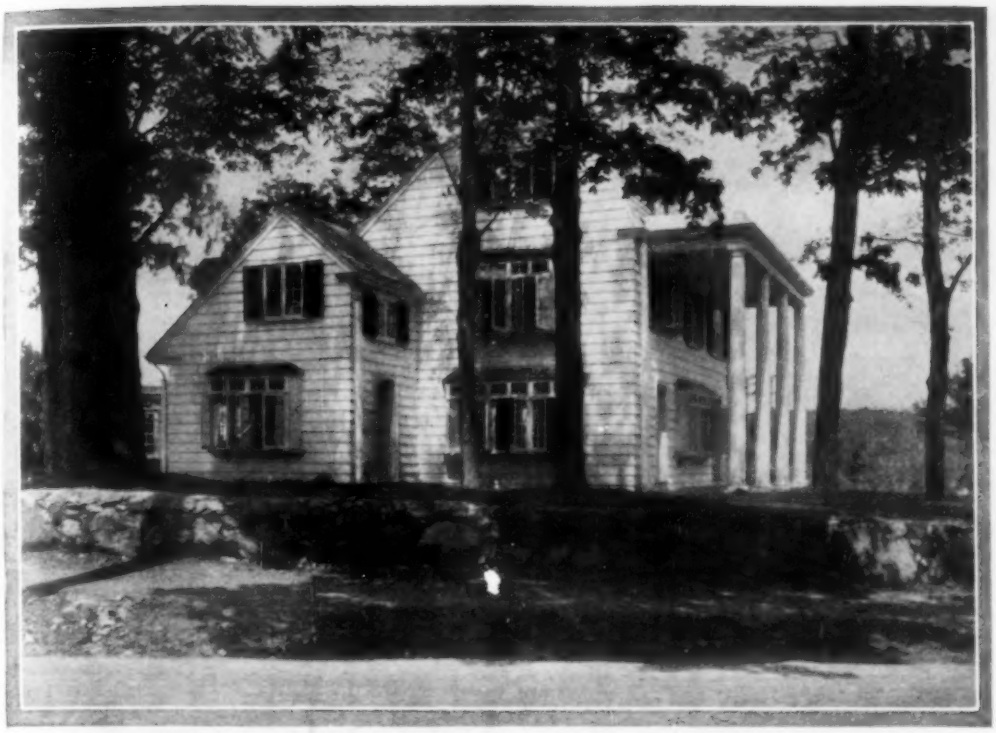
Coal chutes for building into foundation walls are now being made of cast iron instead of steel, and it is said that the former do not rust out as soon as the latter, and will last as long as the building itself. These cast-iron coal chutes are also being made with wire-glass doors, for the purpose of making them more visible, located, as they usually are, in the darkest part of the cellar wall. The chutes are equipped with an automatic latch on the inside of the door.



LARGE FLOCK OF TURKEYS WALKED TO MARKET

A flock of more than 1,700 turkeys went on a cross-country hike in Walla Walla County, Washington, recently, when two farmers, living near Waitsburg, decided to drive their feathered charges to the market at the city of Walla Walla. The going was over fairly rough ground, and the 18-mile trip between the two towns consumed over a week.

Grasshoppers, ants, seeds, acorns, and other bits furnished natural food along the way, and this diet was supplemented by coarse meal mixed with cracked corn each night, to keep the birds in marketable condition.



New England House of Concrete Which is So Cleverly Designed and Constructed That It cannot be Distinguished from a Wooden Dwelling Even Though the Observer Stands But a Few Feet Away: It has Been the Subject of Much Interesting Discussion among Noted Architects

A NEW ENGLAND HOUSE OF CONCRETE THAT CANNOT BE TOLD FROM WOOD

By A. J. R. CURTIS

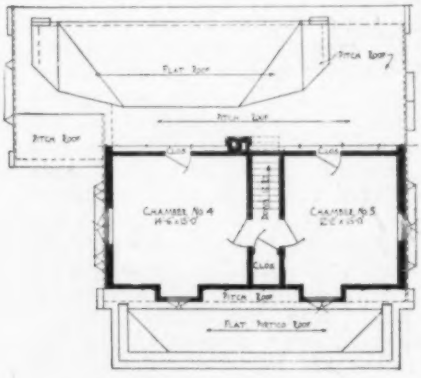
RESIDENCE architects — particularly in the vicinity of staid old Boston — find themselves in a quandary over a very unusual concrete house recently designed and built by a distinguished member of the profession. It is a concrete house that looks like a wooden house—so much so, that one may approach within a few feet of it without discovering the difference. Yet walls, floors, roofs, stairs, and steps, within and without, as well as such details as moldings, gutters, cornices, and columns, are entirely of reinforced concrete so placed that it is all one monolithic mass.

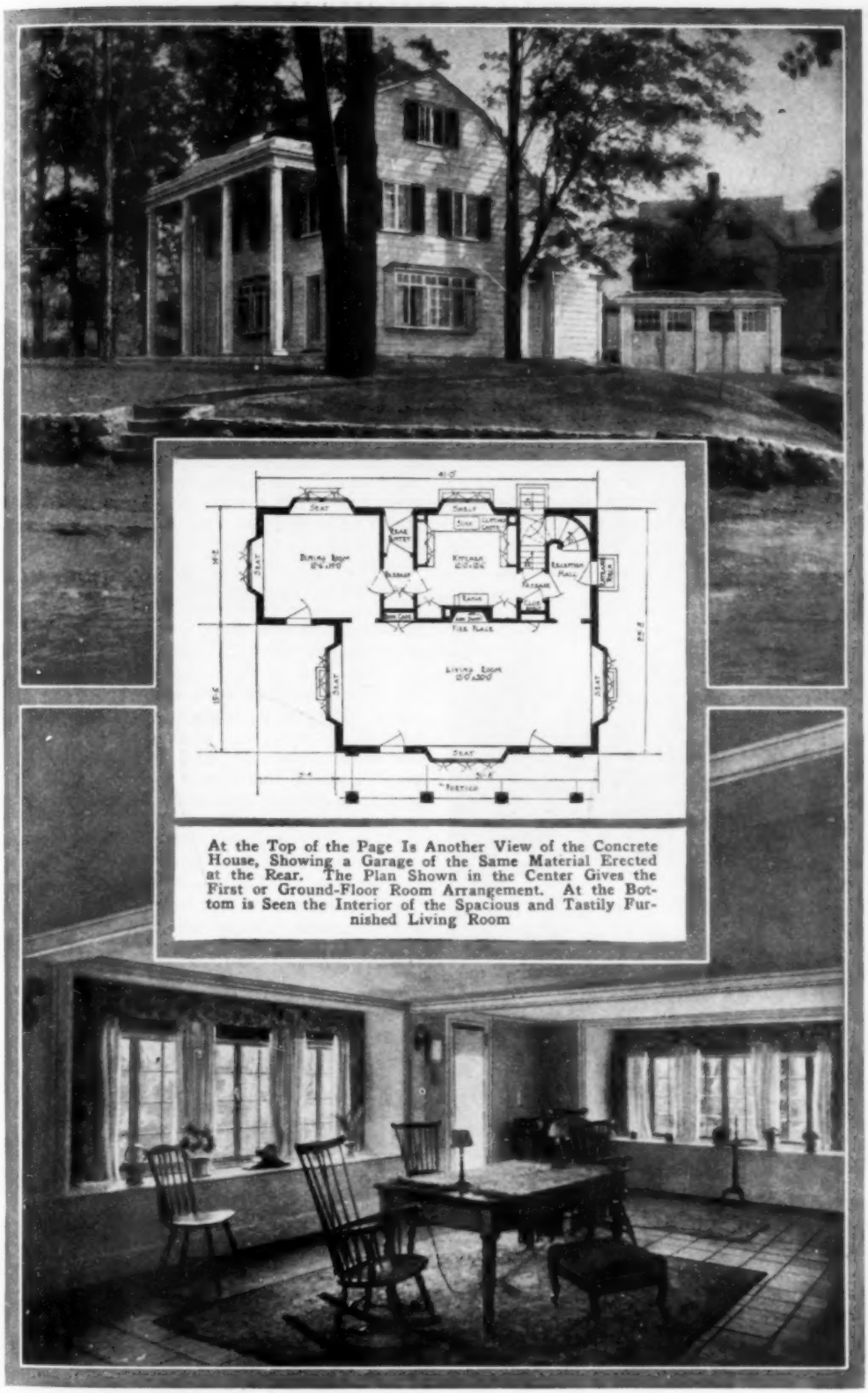
"Is it proper to use one material to imitate another?" and "Is an architect within the bounds of good ethics when he so ingeniously uses one material that it cannot be told from another?" are the questions that are being discussed. The building which has offered the reason for the argument is unquestionably not only an architectural classic, but it is generally mistaken in the community for an example of white-enameled wooden surfaces so common in the better districts of New England.

The architect explains that the old New England farmhouse design, from which this house was created, is good for its own sake, regardless of the materials of which it is constructed; that the simple lines and proportions, not the material, make the architecture. In the acceptance of new materials of construction he does not see why good architecture of the past has to be abandoned, when it can be used to enrich, and really deserves preservation in permanent materials of more recent adaptation.

A study of the design and of the method of construction shows how skillfully form marks have been concealed, and the attention drawn from minor surface flaws by the expedient of building the forms in simple plank panels in the reverse of drop siding. All work is thus

Above Is a Rear View of the Concrete House Displaying Some of Its Harmonious Structural Lines. Below at the Left is Seen the Side Entrance of the Dwelling. The Topmost Plan Shows the Second-Floor Room Arrangement, and That Below the Third Floor





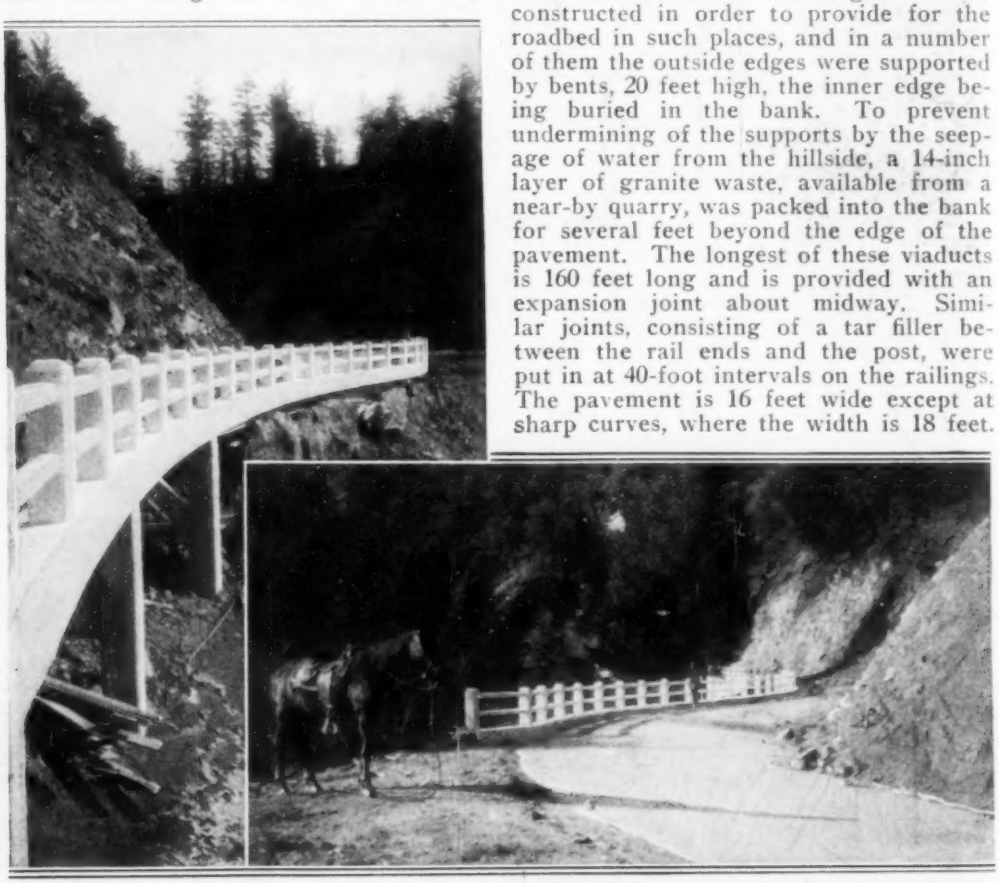
At the Top of the Page Is Another View of the Concrete House, Showing a Garage of the Same Material Erected at the Rear. The Plan Shown in the Center Gives the First or Ground-Floor Room Arrangement. At the Bottom is Seen the Interior of the Spacious and Tastily Furnished Living Room

started and stopped at these definite horizontal lines, doing away largely with possible blemishes and irregularities at the juncture of one day's work with the next. The ridges corresponding to drop siding make it possible to use a very small section of form, as the joints between form settings are well concealed. This saves a great deal of expense in construction.

The interesting house is located at 217 Common Street, Belmont, a suburb of Boston. It has eight large rooms and spacious hallways. The old-fashioned hardware fittings, including door latches and lighting fixtures, were all made by hand by a smith whose work alone makes the house worth a visit. The structure is 30 feet by 44 feet in greatest dimensions, and has walls 10 inches in thickness, which include two 4-inch concrete walls with a 2-inch air space between. The reinforcing consists of ¼-inch deformed steel bars, placed 8 inches apart in each direction. Thus insulated, the plastering was safely applied directly to the inner surface of the concrete.

ROAD TO "BIG-TREE" COUNTRY DIFFICULT TO BUILD

The recently completed highway connecting Santa Cruz, Calif., with the "Big-Tree" country, is of interest because of the unusual scenery along the route and the problems confronting the road builders. The straightest route that was feasible to adopt, was found to lie along the cañons followed by the Southern Pacific Railroad, and it required great care in the handling of materials to keep any from dropping down and interfering with traffic, as in many places the highway was built on a steep slope over 100 feet above the tracks. Four sidehill culverts and 16 concrete retaining walls were constructed in order to provide for the roadbed in such places, and in a number of them the outside edges were supported by bents, 20 feet high, the inner edge being buried in the bank. To prevent undermining of the supports by the seepage of water from the hillside, a 14-inch layer of granite waste, available from a near-by quarry, was packed into the bank for several feet beyond the edge of the pavement. The longest of these viaducts is 160 feet long and is provided with an expansion joint about midway. Similar joints, consisting of a tar filler between the rail ends and the post, were put in at 40-foot intervals on the railings. The pavement is 16 feet wide except at sharp curves, where the width is 18 feet.



Left: One of the Concrete Viaducts, Built along Cañon Wall 100 Feet above Railroad Tracks, on Highway to "Big-Tree" Country. In Places, the Outer Edge of the Viaducts were Supported by Bents 20 Feet High. Right: One of the Curves of the Big-Tree Highway

First Steel Scow to be Used on the Lakes of Maine in Connection with the Lumber Industry: This Scow Has a Load Capacity of 30 Tons, and is Pushed through the Water by the Powerful Motorboat at a Speed of Six Miles an Hour in Calm Weather

LARGE STEEL SCOWS FOR USE ON THE LAKES OF MAINE

As the endless-tread tractor has supplanted horses for long-distance hauling in the lumber woods of Maine, so has the steel scow of from 20 to 40 tons' capacity, propelled by a gasoline motorboat, taken the place of the small wooden craft, whose load capacity did not exceed three or four tons, and which was driven through the waters by rowboats in taking fall supplies across the lakes to camps.

The first of these scows has just been put into operation on Mooselookmeguntic Lake, in the Rangeley region. It is 38 feet long, 15 feet wide, and has a load capacity of 30 tons. It is pushed through the water by a powerful motorboat astern. The bow of this motorboat rests against a specially constructed steel bumper, while heavy poles, for all the world like a pair of buggy shafts, extend from the end of the scow along the sides of the motorboat to which they are lashed. In calm weather the motor craft will drive the loaded steel scow at the rate of six miles an hour.

¶As the result of several months of investigation, and of the testimony of an expert hydraulic engineer, the Massachusetts Department of Public Utilities has stopped the sale of securities in connection with a tide-motor project.

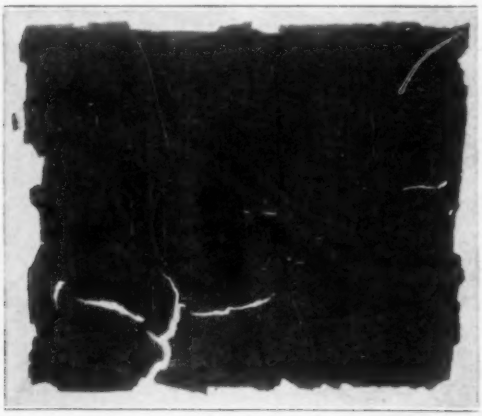
ALARM CLOCK LIGHTS ALCOHOL LAMP

A Frenchman has made a novel use of an alarm clock in adapting it to light, at a predetermined time, an alcohol burner used for heating water or for simple cooking purposes. At the time the alarm sounds, the spring releases a lever which removes the cap from the burner wick. Then a flint-and-steel device strikes a spark that ignites the burner, over which the cooking vessel has previously been placed.

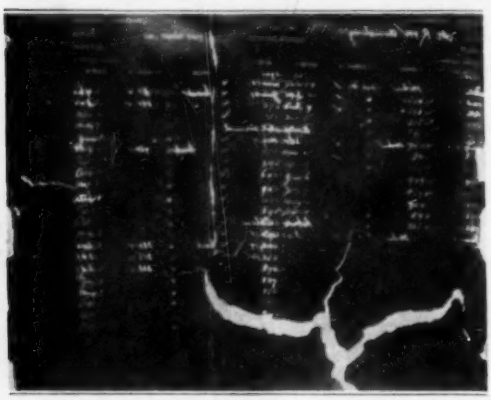
Alcohol Lamp and Alarm-Clock Device Which Lights the Lamp for Those Who Prepare Their Own Light Breakfast

NEW METHOD OF DECIPHERING BURNED RECORDS

Acting upon requests to decipher illegible documents and papers, particularly those that have passed through fire without being burned to ashes, the Bureau of Standards has worked out a method that is very effective and comparatively simple. It is based on the principle that a photographic plate or film, besides being sensitive to light, is also sensitive to certain gases or vapors. Some of these have the property of fogging or rendering developable such portions of the plate as are exposed to their action, while others partially or completely desensitize the plate. The specimen under investigation is placed between two photographic plates and kept in intimate contact with the sensitized coating in the dark, for a period of two weeks in the case of fast plates. On development in the usual manner, a perfect copy of the writing and printing is obtained; from which it is evident that the charred paper gives off gases that fog the plate, and that, where ink is present, there is little or no effect, the ink apparently acting like a screen and preventing the emanation of gas. It is interesting to note that the writing on both sides of the charred paper appears, that on the back being fainter than that on the face, indicating that the ink penetrates the paper to such a depth that its residue reduces the amount of gas escaping from beneath the ink.



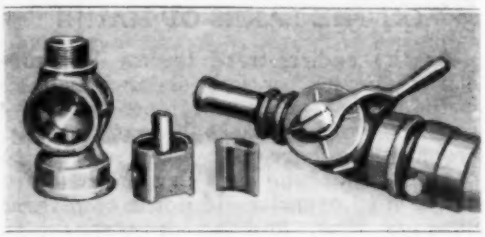
Charred Paper, the Writing on Which was Made Legible on Photographic Plates after Two Weeks' Contact in the Dark



Appearance of Developed Negative after Two Weeks' Contact with Charred Paper: Writing on Both Sides of the Paper Is Visible

FIRE-HOSE SHUT-OFF VALVE HAS NEW FEATURES

A new quick shut-off fire-hose valve has been developed that combines simplicity of construction with assured water-tightness. The valve, the body of which is integral with the fire-hose nozzle, is somewhat like a shut-off cock, but instead of being solid, the plug is cast in two parts. The larger part has an opening for the passage of water and also carries the stem by which the plug is turned. Two small holes drilled through the valve allow the water pressure to force the smaller part of the plug against the valve seat. No packing is required, and the single washer used is held tight against the ground joint of the cap.



Fire-Hose Shut-Off Valve Which Combines Simplicity of Construction with Assured Water-Tightness

PROVE ELECTRIC ARC A SOURCE OF COAL-DUST IGNITION

That coal dust suspended in the air, under conditions likely to occur in pulverized-coal plants or in coal mines, can be exploded by an electric arc, has been proved by recent tests made by the Bureau of Mines. These tests indicate that in such places, all electrical equipment and devices should be housed in compartments that will prevent contact with the dusty atmosphere.

IMPROVED LOADER HAS SELF-CONTAINED DRIVE

For handling economically such materials as sand, gravel, coal, or coke, a new type of portable loader is an improvement in many respects upon other machines of this kind.

Elevator in Position for Transporting the Self-Propelling Loader, Which is Driven by the Same Motor as the Elevator

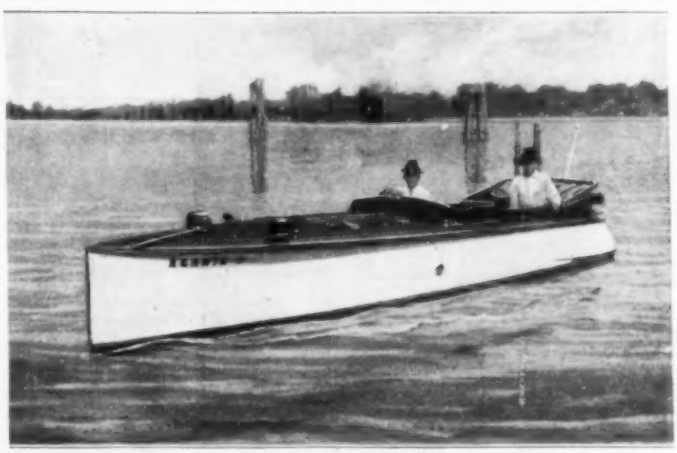
Portable Loader Shown Digging into a Pile of Material and Loading It from a Height of 9 Feet 6 Inches into a Motor Truck

The loader is composed of an endless link belt with digging buckets connected to it that have renewable steel cutting edges.

The machine is mounted with three-point suspension on the portable frame in connection with two pairs of wheels that travel on the endless-tread principle. The machine is self-propelling, either gas or electrically driven, and has two speeds, one for moving from place to place and a slower speed for digging into the pile of material. The loader will discharge at a height of 9 feet 6 inches.

SPEEDY MOTORBOATS MANNED BY GAME WARDENS

The state of Illinois has purchased a fleet of eight high-powered motorboats for the water police service, in order to avoid the necessity, that has existed in the past, of having to commandeer private launches when patrol duty was necessary. It is hoped that with the help of these new motorboats violations of the game and fish laws will be suppressed. Manned by game wardens, these boats will patrol the rivers of the state, and the efficiency of the department should be increased.



One of the Fleet of Eight Patrol Boats Bought by the State of Illinois to Help the Game Wardens Round Up Violators of the Game and Fish Laws

STEREOSCOPIC DEVICE AIDS MOTION STUDY

By means of a simple device, the invention of an expert motion-study engineer,

Simple Device That Aids Motion Study of Workers and Machines, Photographed by a Stereoscopic Moving-Picture Camera

apprentices and students can study the movements of a proficient worker who has been photographed with a stereoscopic motion-picture machine. The device consists of an ordinary set of stereoscopic lenses suitably mounted on a frame carrying two rolls, from which the film is wound and unwound.

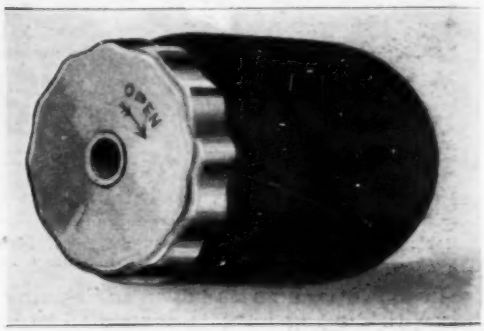
NOVEL MEANS OF TRANSPORT FOR SMALL LOADS

A new device used in Germany for transporting small loads, consists of a metal plate encircled by a rubber tire, similar to a motorcycle wheel, and fastened to a bent handle, through which it passes. A piece of pan-shaped metal forms, with the wheel to which it is attached, a receptacle for liquids, books, or other material. A load of 100 pounds can easily be pushed a long distance by hand, or the carrier can be used as a trailer for cycles. Larger machines are being built.

Above: Transport Device Taken Apart, Showing Receptacle for Various Articles. Right: Device Assembled and Ready for Use

AUTOMATIC TIRE INFLATER HANDY FOR THE AUTOIST

An extremely handy device for inflating a tire is in the form of a small, strong drum that is filled with a gas, harmless to rubber, and sufficient in quantity to inflate a tire to 65 pounds' pressure, without jacking, in a few seconds. In the cap of the drum is a threaded hole into which is screwed the tire-valve stem. The drum is turned until it is apparently tight on the stem, and then the cap is held with one hand while the drum is

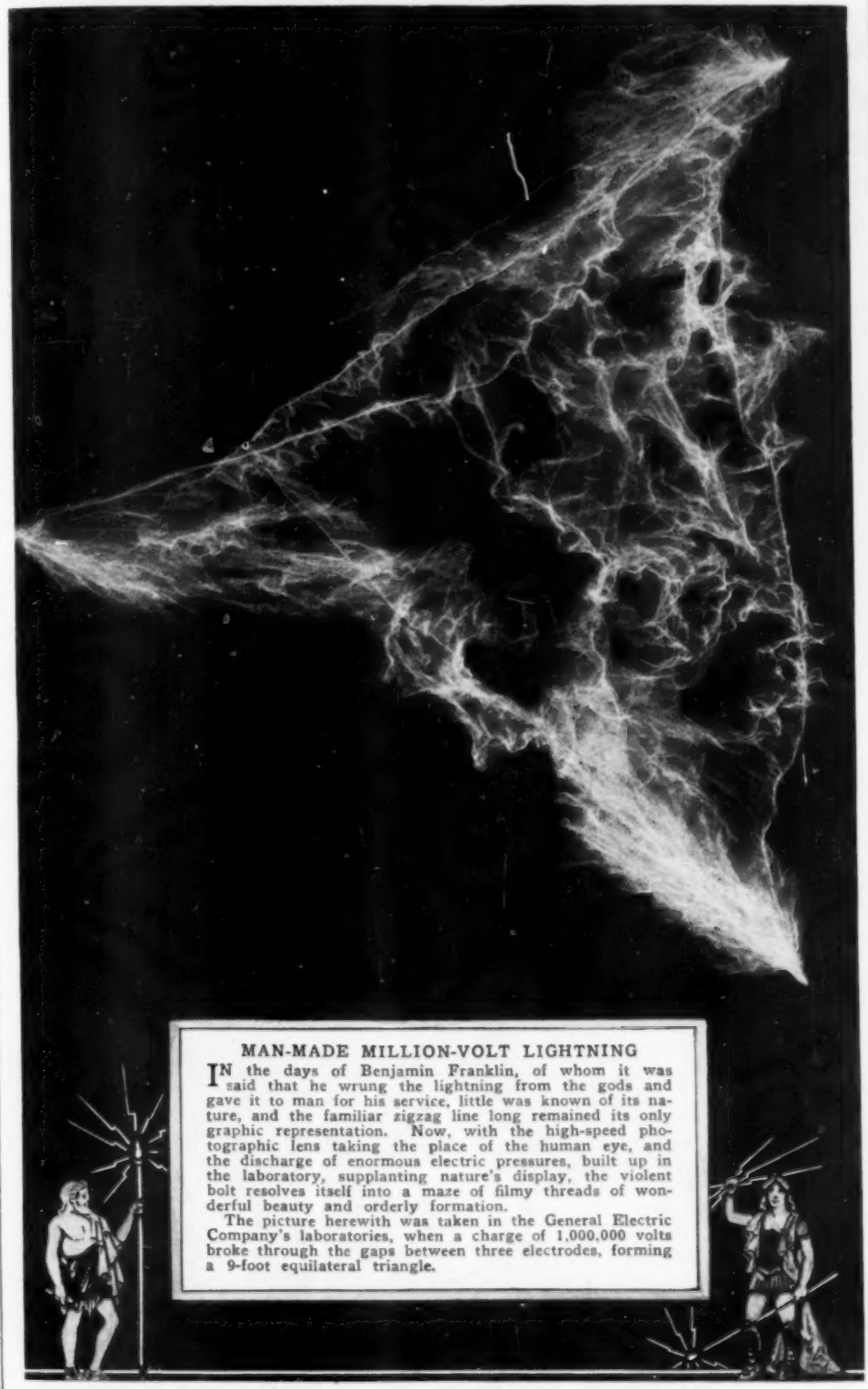


Novel Tire Inflater That is Screwed onto the Valve Stem and Inflates the Tire to 65 Pounds' Pressure in a Few Seconds

turned with the other in the same direction, causing the gas to flow into the tire. A reverse motion stops the flow of the gas.

EGYPTIAN OFFICIALS ARRIVE FOR AUTOMOTIVE COURSE

Six representatives of the Egyptian ministry of transport and communication recently arrived in this country for the purpose of taking a course in automotive engineering. Their entire expenses are being paid by that country. While the exact curriculum for these men has not been definitely decided upon for the length of time they will be here, the first year, at least, will be spent at a Michigan school. Here they will be taught tractor mechanics, tire and battery repairing, oxyacetylene welding, automotive electricity, and general machine-shop work.

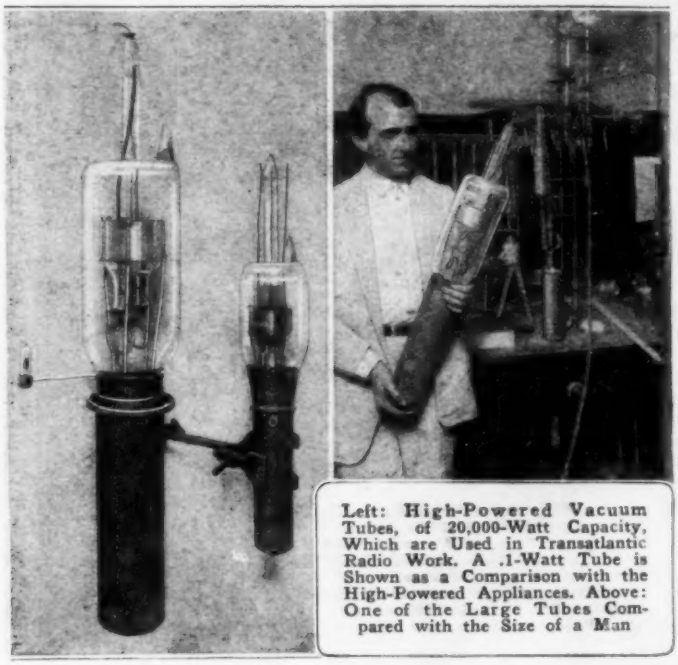


MAN-MADE MILLION-VOLT LIGHTNING

IN the days of Benjamin Franklin, of whom it was said that he wrung the lightning from the gods and gave it to man for his service, little was known of its nature, and the familiar zigzag line long remained its only graphic representation. Now, with the high-speed photographic lens taking the place of the human eye, and the discharge of enormous electric pressures, built up in the laboratory, supplanting nature's display, the violent bolt resolves itself into a maze of filmy threads of wonderful beauty and orderly formation.

The picture herewith was taken in the General Electric Company's laboratories, when a charge of 1,000,000 volts broke through the gaps between three electrodes, forming a 9-foot equilateral triangle.

HIGH-POWERED VACUUM TUBES FOR RADIO WORK

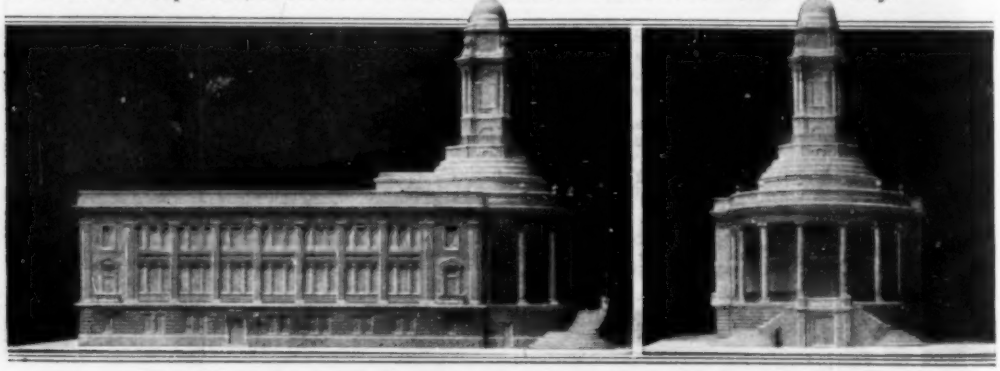


Left: High-Powered Vacuum Tubes, of 20,000-Watt Capacity, Which are Used in Transatlantic Radio Work. A .1-Watt Tube is Shown as a Comparison with the High-Powered Appliances. Above: One of the Large Tubes Compared with the Size of a Man

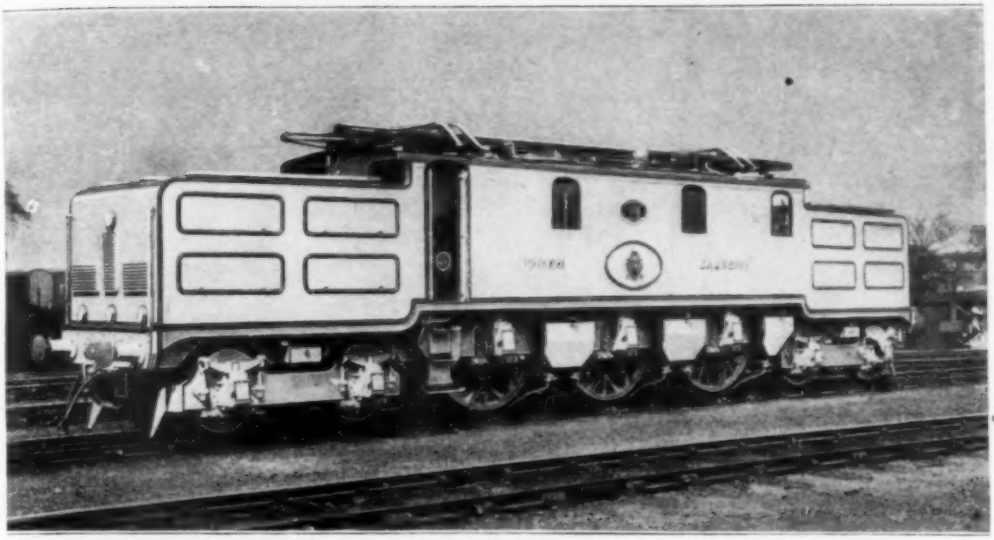
High-powered vacuum tubes have recently been successfully used in transatlantic radio work, signals having been transmitted and received between Nauen, Germany, and Rocky Point, L. I. The tubes were of 20-kilowatt capacity. Development of these vacuum tubes has proceeded steadily from a beginning of .1 or .2 watt, up to the point where they now handle 20,000 watts. Tubes even larger than this are now under construction. One of them, designed for a capacity of 100,000 watts, promises to be fully as successful as those now in use, in addition to possessing a higher efficiency, because it will have such an enormous amount of power.

LOCAL CITY HALL FOR PHILADELPHIA SUBURB

In Germantown, which is a section of Philadelphia, about six miles distant from its city hall, a local city hall is to be erected at a cost of $450,000, which will contain offices for the transaction of every kind of city business excepting that which might require the attention of a court of record. The new sectional city hall is to be located on the site of what is known as Town Hall, a building almost a century old. The design of the new building is of the Colonial period, and it will be faced with white marble. It will be of fireproof construction throughout, and will have a large front portico with Ionic columns, 24 feet in height. Beneath a tower, capped with a dome, 122 feet above ground level, will be a rotunda, 33 feet in diameter and 37 feet high, in which will be housed a collection of World War memorials. In the tower will be placed the clock and bell from the old town hall. Later on, similar buildings may be located in other sections of the city.



Left: Side Elevation of a Model of a Sectional City Hall That is About to be Erected in Germantown, a Suburb of Philadelphia, Pennsylvania. Right: Another View of the Building, Showing Its Portico with Ionic Columns, 24 Feet in Height, and Its Tower with a Dome, 122 Feet above Ground Level



First Main-Line Electric Locomotive to Appear in Britain: It was Constructed for Use between York and Newcastle, One of the Most Important of the English Railways, but was First Given a Trial over the Short Run between York and Darlington

BRITAIN'S FIRST MAIN-LINE ELECTRIC LOCOMOTIVE

Electric locomotives for suburban and interurban traffic have been used in Britain, as in America, for a number of years, but owing to various difficulties, principally of a financial nature, Britain, unlike America, has been slow in developing this type of engine for main-line work, and it is only now that its first high-speed electric-railway engine has appeared.

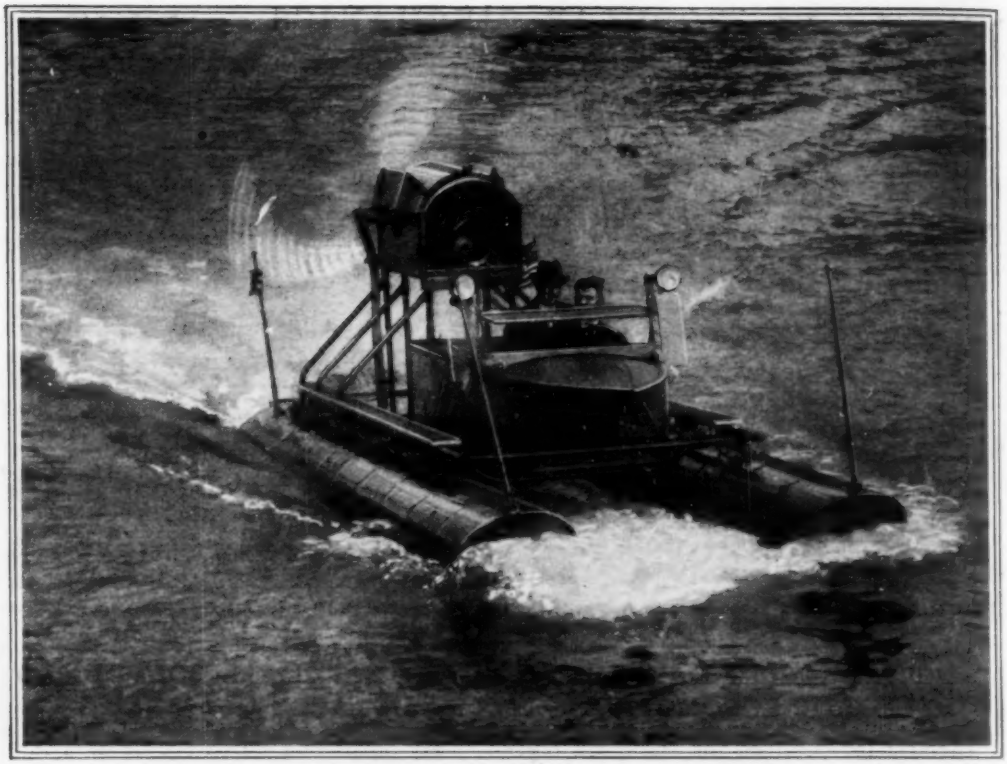
It is designed to travel at a safe maximum speed of 90 miles an hour, and will maintain an average of over a mile a minute on a long-distance journey. Built for one of the most important English railways, it was first tried on the short York and Darlington run—a distance of 44¼ miles—which is at present covered in 43 minutes by steam locomotives, or at a speed of 61.7 miles an hour. This is claimed to be the fastest run in the country. This engine is now used to pull the London and Scotch express over the east-coast route between York and Newcastle. Of 1,800 horsepower, it is capable of performing the above-mentioned high speed hauling a load of about 500 tons. It is fitted with a small electrically heated boiler for producing steam for heating the passenger coaches.

¶A bank building under construction in Oak Park, Ill., will have a room suitably fitted to handle the business of juvenile patrons exclusively.

PAINTING SMALL BOLT HEADS IN LARGE QUANTITIES

Very small bolt heads are painted rapidly, and in large numbers, by inserting them into perforations in a plate large enough to hold hundreds, or even thousands, of them. When the bolts are thus inserted, with their heads in rows, and all flush, a few strokes of the brush is all that is required to paint them.

Perforated Plate in Which Small Bolts are Inserted for Painting Their Heads: This Plate Holds 1,800 Bolts, and It Takes 45 Minutes to Insert Them



This Hydroglider, Built by an American Youth, Draws Only 1½ Inches of Water at a Speed of 45 Miles an Hour, and is Equipped with a Six-Passenger Automobile Body

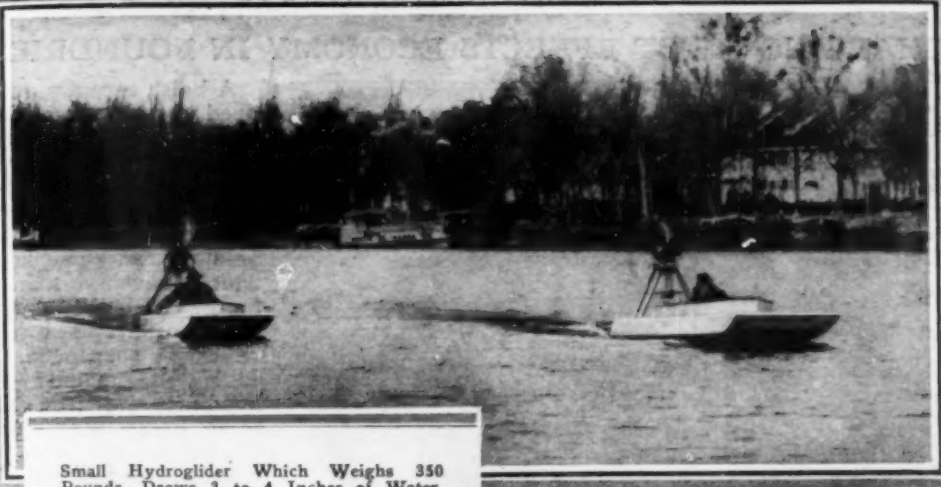
SOME NEW HYDROGLIDERS

By R. C. FOLGER

RECENT designs of hydrogliders indicate the development of a type of water craft that is of interest to speed enthusiasts and may well be adapted to more useful purposes. The hydroglider, which combines some of the features of the hydroplane and the flying boat, is characterized by its light draft and air propeller. One of the latest of these is a cabin hydroglider now being built by a French concern. This craft carries 10 passengers, attains a speed of 45 to 50 miles an hour, draws 8 inches of water, and is propelled by a 190-horsepower engine and air propeller. A smaller glider, which is made by the same firm, and is said to be quite popular abroad, weighs only 350 pounds, draws 3 inches of water, and is driven by a 10-12-horsepower motor and air propeller that gives it a speed of 15 miles an hour.

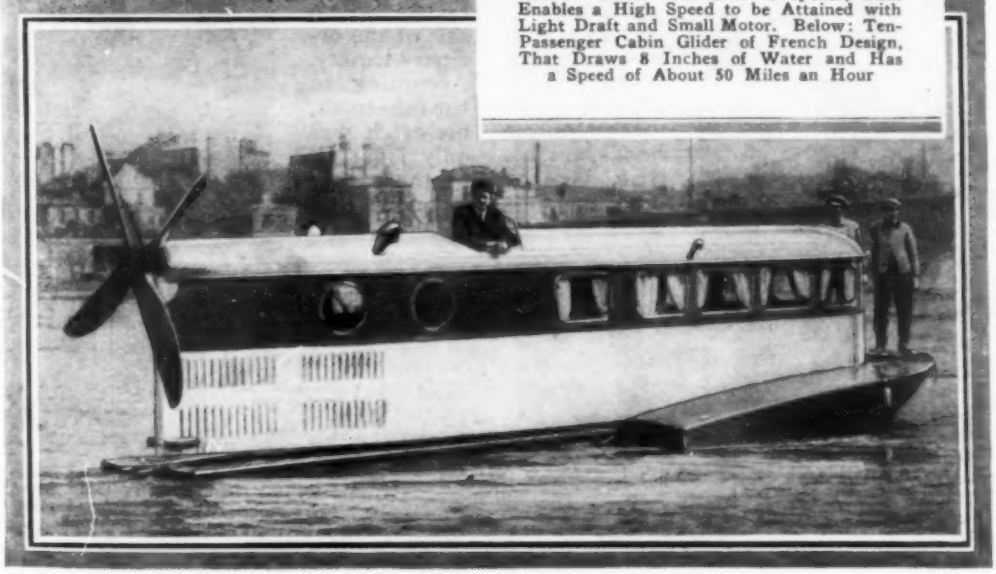
Another French glider that has been developed as the result of recent experiments, features a new idea in the form of a water propeller that lifts the boat from underneath and enables an engine and air propeller, of relatively low power, to drive the boat at great speed. One of the most interesting, which is the product of an American youth, draws 6 inches of water at a standstill and only 1½ inches at a speed of 45 miles an hour. It is nonsinkable and noncapsizable, for it has two pontoons, each with nine water-tight compartments. The regular six-passenger automobile body, placed on a 10-point suspension spring between the pontoons, is equipped with self-starter, windshield, lights, and one-man top and side curtains, making it serviceable in all weathers. It is said that on account of the method of suspending the body, practically no wave vibration is felt, even in a fairly rough sea.

¶A trio of 11-passenger flying boats have maintained a four-trip daily service between Detroit and Cleveland, without a single accident or fatality among the 2,521 passengers carried during the present season. The traveler makes the 90-minute trip in a luxurious cabin that excludes noise and wind.

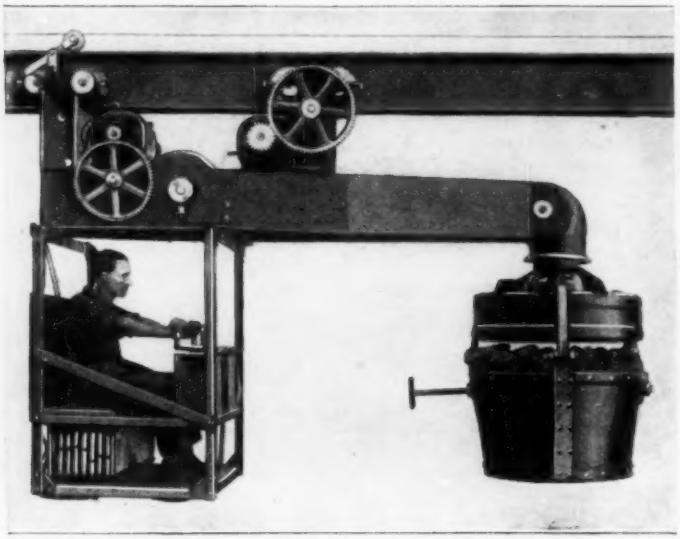


Small Hydroglider Which Weighs 350 Pounds, Draws 3 to 4 Inches of Water, and Makes 15 Miles an Hour with a 10-12-Horsepower Motor

Above: Glider with Lifter Propeller, That Enables a High Speed to be Attained with Light Draft and Small Motor. Below: Ten-Passenger Cabin Glider of French Design, That Draws 8 Inches of Water and Has a Speed of About 50 Miles an Hour



CHARGING HOIST EFFECTS ECONOMY IN FOUNDRIES



New Cupola-Charging Hoist with a Drop-Bottom Bucket Loaded with Coke: The Hoist is Operated Electrically, and the Charging Arm Also Carries a Magnet for Handling Pig Iron and Scrap

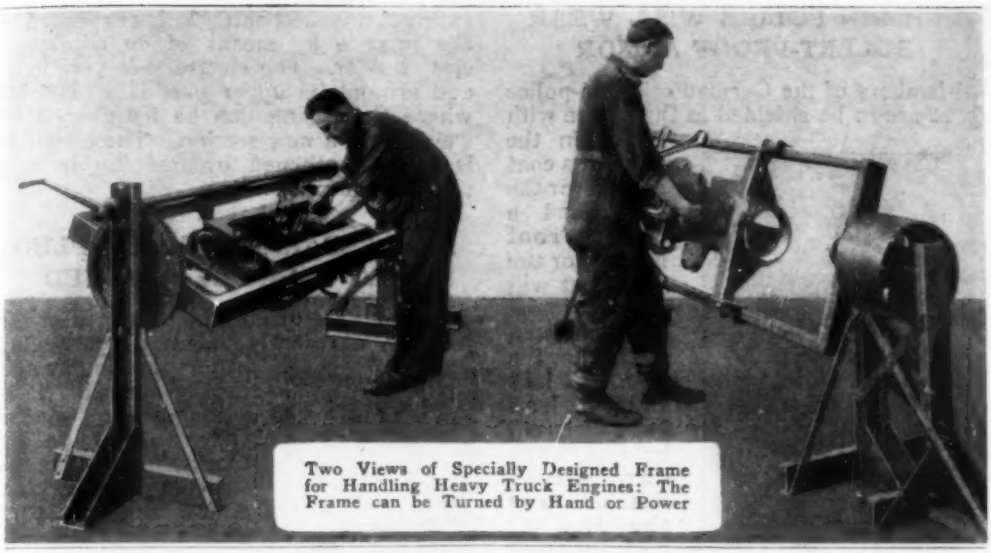
A hoist, recently developed, for charging materials into foundry cupolas, reduces the labor of this work and promises other savings in the maintenance of the cupola linings. The hoist, which travels on an I-beam, consists of a cast-iron cantilever arm from which is suspended, by cables, a magnet for handling pig iron and scrap, or a bottom-dump bucket in the case of coke. With this method, all the charged materials are deposited in the center of the cupola without any abrasive action on the lining, and the charge is evenly distributed. The hoist has a capacity of 400 pounds.

CATCH BASS WITH LIVE MICE AND TOY BALLOONS

Outwitting the wary bass by a combination of live mice and toy balloons, was the latest successful scheme of an angler in an effort to secure a string of these fish. Bass, as is well known by fishermen, are particularly fond of mice. With this fact as the basis, a sportsman, after procuring several live mice in traps, fastened one of these, just ahead of the hooks, on his line. One or two balloons were then attached to the line in such a manner that the mouse was kept afloat and was free to paddle around in the water. With this odd tackle, a number of large bass were caught in a lake known to be well supplied with fish, which, however, were the despair of anglers who had tried to catch them with bait of the ordinary variety. According to the fisherman, his catch was only limited by the supply of mice and balloons.

Above: Attaching Live Mouse to the Line. Right: Rod and Line with Balloons Attached

Above: Catch of Bass Which was Only Limited by Supply of Mice and Balloons



Two Views of Specially Designed Frame for Handling Heavy Truck Engines: The Frame can be Turned by Hand or Power

FRAME FOR TRUCK ENGINES FACILITATES REPAIRS

The repairing of extremely heavy motor-truck engines has been facilitated by the introduction of a frame on which the engine, after it has been removed from the chassis, may be securely bolted. The frame is about waist-high, and has a ratchet and gear attachment with which it may be tilted to any desired angle. The mechanic is thus enabled to place the outfit in various positions, may sit down or stand up as he wishes, and always has convenient access to any of the parts. This frame was designed by the shop superintendent of a large truck company and has proved a successful means of reducing the overhauling costs of its many engines.

PECULIAR STONE RESEMBLES HUMAN WORKMANSHIP

A queer-looking stone found a short time ago in the mountains near Chattanooga, Tenn., at first appeared to be a relic of the workmanship of an ancient people, but a more careful examination showed it to be an odd geological specimen. The stone is an approximate cube of sandstone, 3 feet on a side, on the top of which appear more than 150 pigeonholelike openings, the partitions of these being of iron. Many of these spaces are filled to the top with sand, which under the action of the sun and elements has become baked and hardened into a solid; others are open and fully 2 inches deep. So much do the holes resemble the work of human hands it is difficult to believe the stone was not in use by prehistoric man. However, geologists are inclined to believe that the particles of iron have in bygone ages become associated in the partitions that now form the holes. Seams between the partitions make the resemblance to human workmanship the more striking.

Odd-Looking Geological Specimen Which Has the Appearance of Pigeonholes Made by Prehistoric Man

GERMAN POLICE WILL WEAR BULLET-PROOF ARMOR

Members of the German criminal-police force are to be shielded in the future with armor in the form of a coat of mail for the body, and a bullet-proof helmet for the head that will afford almost complete protection for the eyes. This armor has been proved by test to be capable of withstanding the fire of high-powered automatic pistols. The throat and neck are also protected with a bullet-proof collar above the coat of mail.

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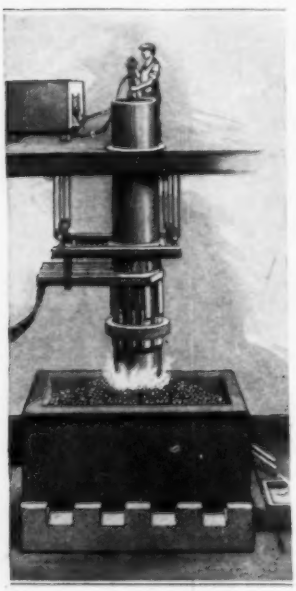
SELF-BAKED RENEWABLE TYPE OF FURNACE ELECTRODE

An electric-furnace electrode that is claimed to be everlasting, is built, baked, and renewed in its actual location in the furnace of which it is a part. Once installed, it will last at least as long as the furnace. Into a casing made of thin sheet iron, that serves as a mold, ordinary electrode mixture is tamped. The lower part of the electrode protrudes from this casing, and is placed in the smelting furnace, where it is baked by the heat from the crater, and also by that developed by the current in the electrode. Thus it consists of a lower internal baked part, and an upper external unbaked part. It is suspended in the furnace by means of an adjustable clasp holder. The electrode is very long, and around its upper part is a platform where the casing can be lengthened by welding on a new section. The electrode is then lengthened by tamping in new electrode mixture.

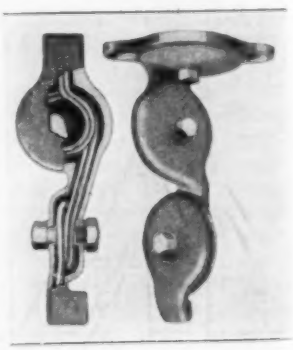


NEW SEPARABLE SPARK PLUG THAT IS EASILY CLEANED

Without disturbing the porcelain or the packing, a recently patented spark plug can be thoroughly and readily cleaned. It is a modification of the separable type of spark plug, and is constructed so that part of the iron shell that screws into the cylinder can be unscrewed from the rest of the plug, making it easy to clean both the electrodes and the porcelain insulation, without having to remove any gland nut, or to interfere with the gaskets, as in separable plugs. The facility with which it is taken apart eliminates danger of breakage.

SELF-ADJUSTING LAMP ARMS FOR LOCALIZED LIGHTING

A type of self-adjusting arm with elbow, wrist, and telescopic action, is a fixture for local electric lighting, by means of which the light can be moved in a direct line from one point to another. In connection with the arm, each of the flexible joints consists of two dished cast-iron disks held together by a screw that passes loosely through the center of one disk, and is screwed rigidly into the center of the other.



At the Left Is a General View of One of the Six Units of Moreland Courts, the $30,000,000 Apartment-House Development Now under Way in Shaker Heights, an Exclusive Residential Section of Cleveland, Ohio. At the Right is Seen One of the Many Beautiful Entrances in the Group of Buildings

APARTMENT-HOUSE PROJECT TO COST $30,000,000

One of the largest building projects ever attempted in this country is now under way in Cleveland, Ohio, where ground has been broken for the beginning of a $30,000,000 apartment-house development. The project consists of six structures which will accommodate 1,000 families. In addition to the vast number of apartments, there will also be included stores, markets, an English inn, and a motion-picture theater. The structures will typify the history of English architecture. Types of Georgian, Jacobean, Elizabethan, and Tudor architecture, will be arranged so as to blend harmoniously, and yet retain all the distinctive characteristics of these different periods. The site is located in Shaker Heights, an exclusive residential district. The finished apartments will vary in size from 4 up to 12-room suites, all possessing the latest improvements in heating, lighting, refrigeration, and garbage incineration, and it is thought that they will relieve, to a great extent, the general lack of apartment dwellings in that city.

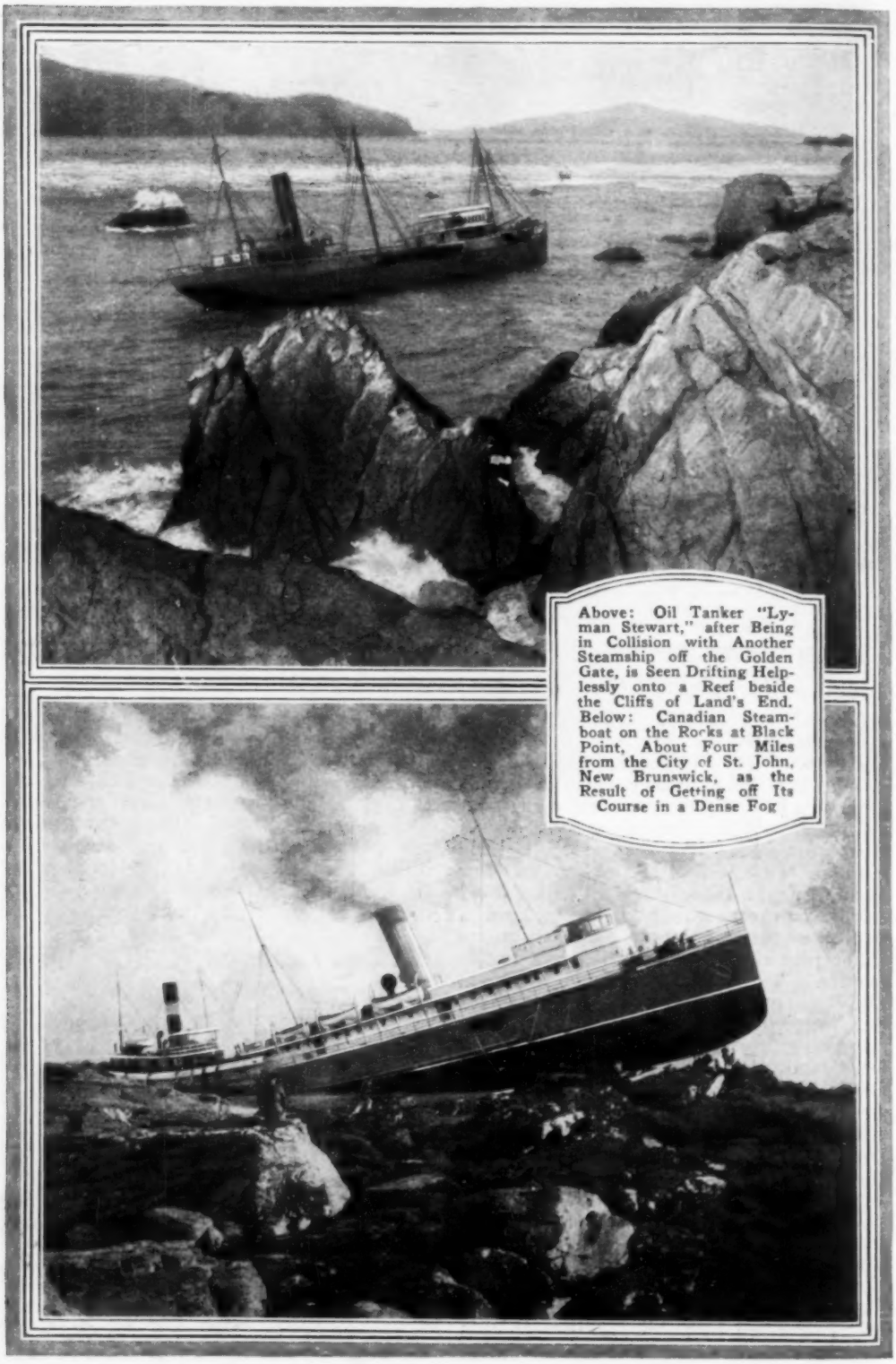
¶At the present time over $15,000,000,000 is invested in public utilities in this country.

HANDY POCKET CASE PROTECTS MICROMETERS

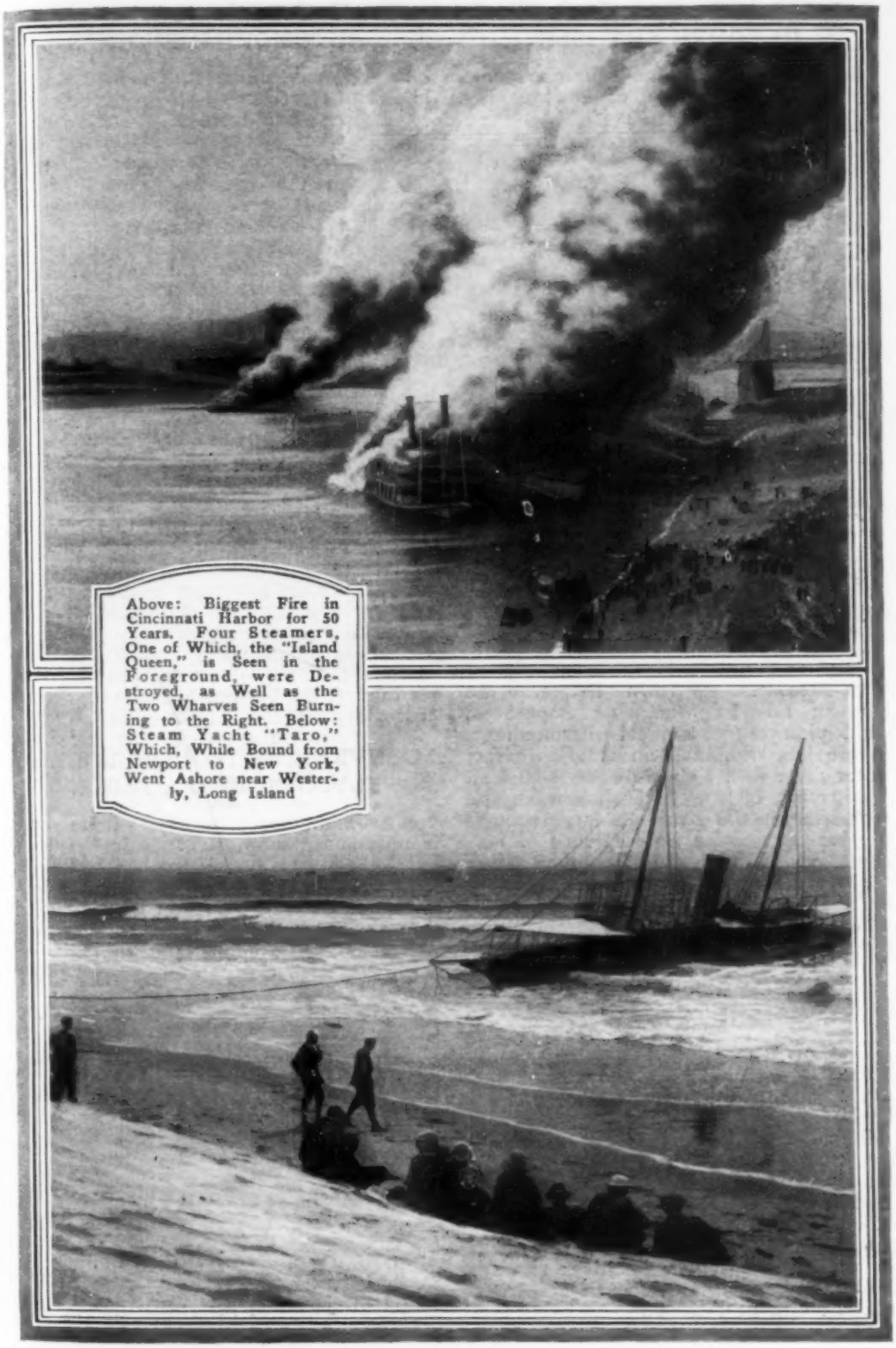
A new pocket case made by a tool manufacturer provides a convenient place in which to keep micrometer calipers, besides affording protection against dirt and injury. Made of metal, leather-covered and plush-lined, it is shaped to fit into the pocket without causing much of a bulge, while the inside is properly formed to hold the instrument tightly. There are several styles for different types.

Above: Convenient Pocket Case for Micrometers Shown Closed. Below: Case Open, Showing How It is Constructed to Fit the Micrometer

PERILS OF THE SEA STRIKINGLY ILLUSTRATED



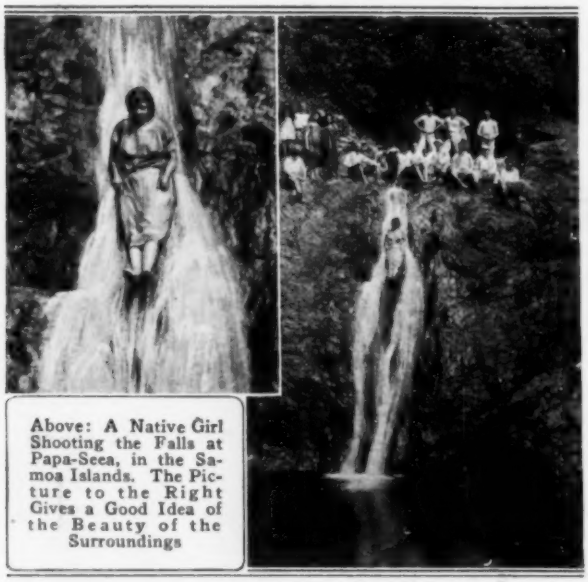
Above: Oil Tanker "Lyman Stewart," after Being in Collision with Another Steamship off the Golden Gate, is Seen Drifting Helplessly onto a Reef beside the Cliffs of Land's End. Below: Canadian Steamboat on the Rocks at Black Point, About Four Miles from the City of St. John, New Brunswick, as the Result of Getting off Its Course in a Dense Fog



Above: Biggest Fire in Cincinnati Harbor for 50 Years. Four Steamers, One of Which, the "Island Queen," is Seen in the Foreground, were Destroyed, as Well as the Two Wharves Seen Burning to the Right. Below: Steam Yacht "Taro," Which, While Bound from Newport to New York, Went Ashore near Westerly, Long Island

SLIDE WATERFALL FOR SPORT IN SOUTH SEA ISLE

What appears to be a unique sport, combining the thrills of tobogganing, skiing, and diving, is indulged in at Papa-Seea, near the town of Apia, in the Samoan Island group. At Papa-Seea, amid picturesque tropical surroundings, nature has fashioned an almost perfect water glide with a drop of about 60 feet. The action of the water has worn the rock smooth, the stream is large enough to give the human slider plenty of momentum, and the deep pool at the bottom is so small that even a poor swimmer can make shore. The sport is in great favor with native girls, who make a pretty picture as they shoot down.



Above: A Native Girl Shooting the Falls at Papa-Seea, in the Samoa Islands. The Picture to the Right Gives a Good Idea of the Beauty of the Surroundings

MOTOR-BUS SPEAKING TUBE IS AID TO DRIVER

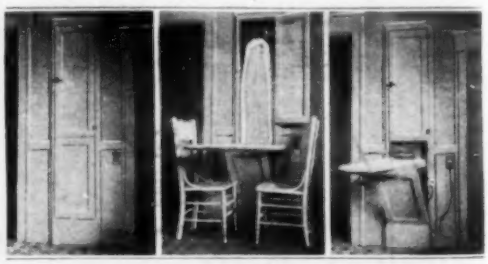
One of the recent models of motor busses has, along with numerous other conveniences, a speaking tube which extends from the outside rear of the machine to a point inside, at the front near the driver, who is thus enabled to hear the signals of cars approaching from behind that desire to pass. It is expected that this feature will be of great service to drivers of these busses in aiding them to allow the speedier machines to pass readily and without danger of accidents, which might be caused by crowding and consequent skidding off the roadway.

METHOD OF VAPOR-COOLING AUTOMOBILE ENGINES

In a vapor-cooling system for automobile engines, recently developed, the vapor or steam from the cylinder jacket, wherein the water is constantly boiling, goes to the bottom tank of the radiator instead of, as usual, to the top. Consequently, there is never any water in the radiator, and therefore the working surface can be kept at a very high temperature. With this system, the working surface is never cooler than 210° F., which means that, with the air as high as 80°, there is a difference of 130°. Thus there is a very high heat transfer and a correspondingly high radiator efficiency. Moreover, when alcohol is added to the water in winter it will be condensed automatically, and since the system is closed, there will be no loss by evaporation. Another most important feature is that the high average temperature allows the size of the radiator to be greatly reduced, at a consequent economy in first cost and in weight. This system may have a water filler at the bottom of the tank, or the customary top cap may be used.

CONVENIENT IRONING-BOARD SUPPORT ALSO A TABLE

A combination breakfast table and ironing-board support, which folds into a narrow closet, is one of the latest kitchen novelties. When ready to iron, a lower door hinged to the bottom of the closet is pulled outward to serve as a brace. The table in its folded position is then put in place as a support for the ironing board, also kept in the closet. Unfolded, the support makes a small breakfast table.

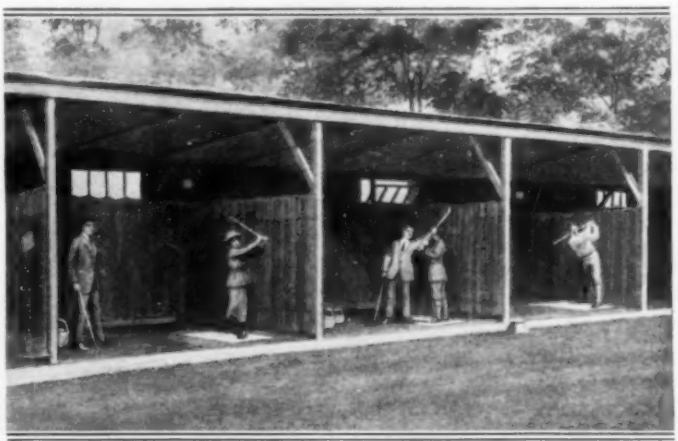


Left to Right: Support and Ironing Board Concealed in Wall; Support Let Down as Table, and Ironing Board Ready for Use

That English Women Are Fond of Golf Seems Evident from This Picture Which Shows the Bunkers before the "Target Net" at the Outdoor Golf School at the Kensington Gardens, London

OUTDOOR GOLF SCHOOL IN LONDON PUBLIC PARK

An outdoor golf school, with a shed for driving in wet weather, bunkers, and a large "target net" is arranged at the Kensington Gardens in London. There are several unusual advantages to be found in connection with this school, not the least of which is the fact that, although located in the open, it is not far removed from the main business and theatrical districts. By means of specially built bunkers and a great target net painted with white circles, it is possible to practice any kind of shot. The results of the drives in each case can be accurately determined by watching the section of the net to which the ball is hit. Many women in London are taking up the sport, and it is not unusual to find the school bunkers almost entirely occupied by them. It seems to be a habit with some to break away from housework for an hour or so each day. During the noon hour, business men, also, come for a short period.



Each Stall in This Shed is Fitted with a Teeing Ground So That Long Drives may be Practiced. The Protection Afforded Permits Playing in Disagreeable Weather

CITY FIRE ESCAPE IS HOME OF BEE FAMILIES

The Beehives Arranged on This Fire Escape in a Congested District of Boston, House More than 40,000 Bees; This in Spite of the Fact That the Bees must Fly Several Miles Before Flowers are Reached

High on the fire escape of a building in a congested section of Boston live several colonies of honeybees. There are between 40,000 and 60,000 of them, according to the owner, who makes a hobby of keeping the insects. In order to obtain nectar to live on, and pollen to feed their young, the bees are forced to fly from 2 to 5 miles to the flowers in public parks and playgrounds. They never bother the hundreds of people working in nearby buildings.

HARD SYNTHETIC WOOD MADE FROM CELLULOSE

Cellulose, a compound of carbon, hydrogen, and oxygen that forms the fundamental cell structure of all plants, is a main constituent of a vast number of textiles, in the manufacture of which it does not have to be hardened. In the past it has been hardened sufficiently to produce substances used in many industries, and now, in Germany, a textile expert has discovered a process by which it can be hardened sufficiently to produce synthetic woods that will serve as substitutes for oak, mahogany, walnut, indeed for any hard wood—even, it is said, for ebony. Moreover, the material can be dyed homogeneously in any color from bright yellow to deep black, and can then be polished and made to look exactly like natural wood.

This synthetic product will be much cheaper than real wood because it is made from vegetation available in large quantities, much of which is of otherwise little or no value, such as straws of all kinds, banana and other leaves, and any kind of grass. In all its characteristics it resembles hard wood, not being brittle like many other cellulose products, and being easily cut and machined. Moreover, it can be molded into any shape, such as boards, slabs, and parts of any inlaid pattern, thus saving a large amount of labor. It has other advantages, for it is not so inflammable as wood, and it has wonderful insulating qualities against both electricity and high or low temperatures.

Bundle of Grass with Samples of the Synthetic Wood Made from This Cellulose Material: The Broken Sample Shows How It is Formed of Layers of Cellulose Pressed Together. It can be Molded into Any Shape, and Is as Hard as Oak, or Even Ebony

ILLINOIS MAKES ITS HIGHWAYS SAFE

By R. FRANKLIN MUNDORFF

THE state of Illinois, in taking up the marking of state highways, did not follow any system practiced by other states, but devised a plan of its own. This plan was designed to serve a twofold purpose: First, to make the highways as safe as possible under present-day traffic conditions; and second, to give as complete directory information to the traveling public as would be practicable.

This Sign Has "Danger" Lettered in Red on a White Background, While the Words "State Road" Are in Smaller Black Letters

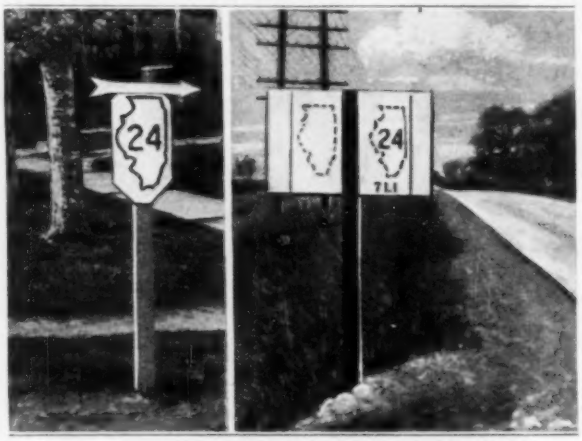
To accomplish the first purpose, wood signs, 42 inches wide and 24 inches high, with black letters on a white background, were erected along the completed highways. These signs, which are located 400 feet each way from every point of potential danger, are carried on 4 by 4-inch wooden posts, set 15 feet from the center of the pavement on the right-hand side; the bottom edge of the sign being 4 feet above the pavement.

On all side and crossroads connecting with the state roads, the signs read: "Danger—State Road"; the word "Danger" being painted red on a white background, and the letters 7 inches high and 4¾ inches wide. The words "State Road" are in black letters, 5 inches high and 2½ inches wide.

Left: Signs Indicating Caution over a Certain Distance Have Black Letters on a White Field with Diagonal Black and White Border. Center: Sign Denoting the Reason for Caution. Right: This Black-and-White Sign Indicates Slowing Down, and Degree of Care Necessary

On paved roads the signs read: "Look," "Caution," or "Danger," depending upon the location; the first being used where the driver need not slacken speed but should be on his guard; the second, where some speed reduction and care are necessary, and the last-mentioned where there is imminent danger.

The letters in the words "Look" and "Caution" are 7 inches high and are black on a white background, and in the word "Danger" of the same height, but are red on a white background. Beneath these words, the nature of the danger is indicated.



Left: Aluminum Route Marker Denoting Curve or Turn at a Street Intersection. Right: Back of Warning Sign at Crossroad, Bearing Outline of State Border and Giving Route and Mileage Numbers

Where continuous care for a certain distance is necessary, caution zones have been established. These are marked at each end with a board lettered "Caution Zone." These signs have a border of diagonal black and white stripes approximately 2 inches wide. Throughout the zone all poles, bridge rails, and other stationary objects, and where necessary, special posts near the points of potential danger, are painted with diagonal black and white stripes, in order to avoid a great number of confusing separate signs.

Before the final adoption of this system of warning signs, a 60-mile stretch of road was marked in this manner and studied for a period of several months. This study resulted in a number of modifications, which, however, did not essentially alter the system. As finally placed, the signboards are set normal to the center line of the road. At this angle, the signs are quite conspicuous at 1,000 feet or more, and can be read at night at distances of 50 to 100 feet.

Sign That Bears the Name of the City, and Warns the Autoist That the City Limit has been Reached

To accomplish the second purpose—that of furnishing directory information to the traveling public—signs are used in the following manner:

At the corporate limit of each city and village, a signboard of the same size as those carrying the warning signs is erected. The name of the city and the words "City Limit" appear on that side of the sign faced by the traveler when approaching the city. Here also is found, on the right-hand side of the road as the traveler leaves the city, a sign on which are lettered the name of the next town and the distance to it, as well as the name of the next principal objective point on the route and the distance thereto.

All state routes are numbered. The back of each warning sign carries this number. On that side the borders of the state are outlined in black, and within this outline the route number appears in black numerals 5⅜ inches high. Above or below the outline the distance along the route from its northerly or easterly terminus is noted in red numerals.

At crossroads and side roads leading to near-by cities and villages, an aluminum plate appears just below the signboard. On this the state borders are outlined, as before described, with the route number in raised black numerals and the mileage in raised red numerals.

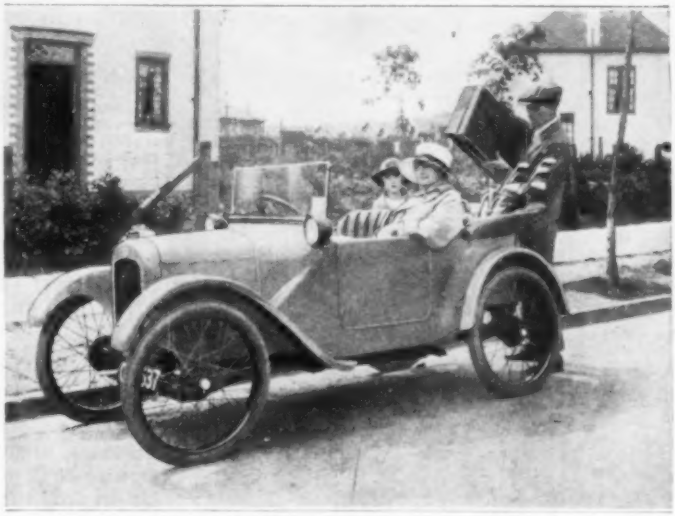
The final scheme is the showing, on a complete road map of the state, not only the route numbers but the mileage numbers of each important intersecting road, which is marked by an aluminum sign. This enables the traveler at any intersecting road to check his exact location by

comparing both the route number and the mileage number of the intersection with those indicated on the map.

Within cities, three different signs are used, all of which have in common a double-faced flat plate, showing the state outline in black and the route number in raised black numerals. At turns, an arrow pointing in the proper direction appears above the standard plate. At even miles the mileage number, in raised red figures, appears at the top of the plate. At other intersections the plate embodies no special features. These signs are located on the far side of the intersecting street, or to the right of the driver.

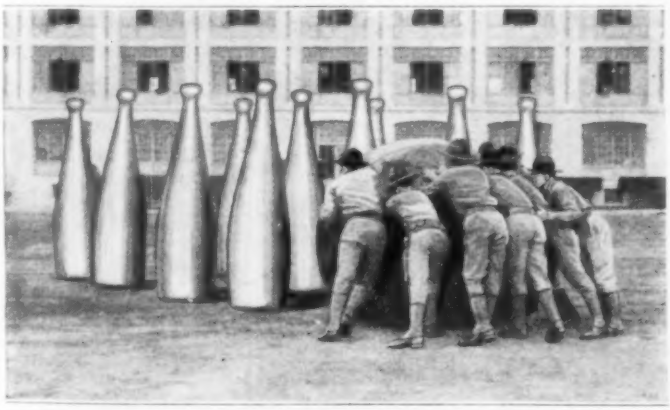
LIGHT CAR OF ENGLISH MAKE HAS MANY MERITS

Another development in the automobile world has appeared in the shape of an inexpensive light car manufactured in England and possessing many of the merits usually found only in the larger and more costly models. The little vehicle weighs less than 800 pounds. It has a 7-horsepower 4-cylinder water-cooled engine, three-speed gear box with reversible gear, shaft transmission, and brakes on all four of the detachable wire wheels. Its length is only 8 feet 8 inches, and width, 3 feet 10 inches. The tiny car seats two persons, has a collapsible top, windshield, side curtains, electric lighting, and during a recent track trial, a speed of 52 miles an hour was attained. It is stated that this car has traveled 78 miles on but one gallon of gasoline.



Light Car, Built in England, Which Has Many of the Merits Usually Found Only in the Larger and More Costly Models: Note the Ample Space at the Rear for Baggage

GIANT BOWLING GAME INVENTED BY U. S. MARINES



The Team of Eight Men in the Photograph Are About Ready to Send the Pushball at the Giant Bowling Pins in Such a Way as to Knock Down the Greatest Number

Feeling the regular form of bowling to be too mild a sport, marines stationed at Mare Island on San Pablo Bay, have devised a new outdoor adaptation of the game. Pins, 10 feet high, are set up in the usual order on a field, and a large-sized pushball is used by a team of eight men. The team, taking a running start, rolls the ball for the pins, and makes an attempt to hit them in such a way as to knock down the greatest number.

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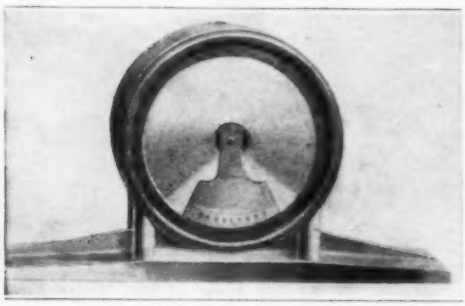
This Realistic Reproduction of a Polar Bear Is the Needlework of a Japanese Artist. It Is Now on Exhibition at the Art Institute, Chicago

REALISTIC PICTURE OF BEAR EMBROIDERED BY ARTIST

Making stitches so fine that they are scarcely discernible, a Japanese artist has embroidered a picture of a polar bear which is remarkable for its realism. The figure is done in silk on a gray-silk background. All the shading and coloring was finished by means of different-colored silk threads, with no part subjected to retouching after the needlework had been completed. The general perspective has been carefully carried out without sacrificing an accurate representation of details. The picture is on exhibition at the Art Institute, Chicago.

INCLINOMETER OF UNUSUAL ACCURACY

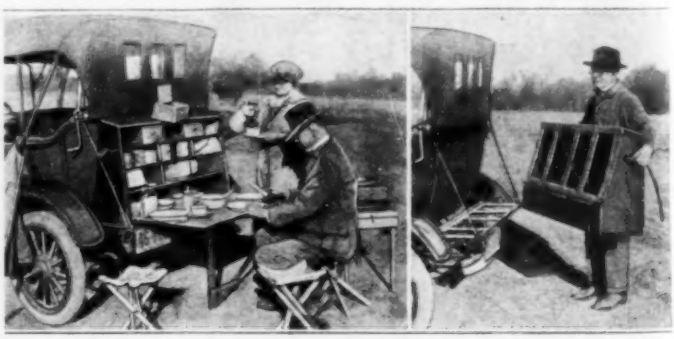


Inclinometer Which Gives Readings in Degrees and Minutes, Showing the Pendulum That Automatically Indicates the Angle of a Surface

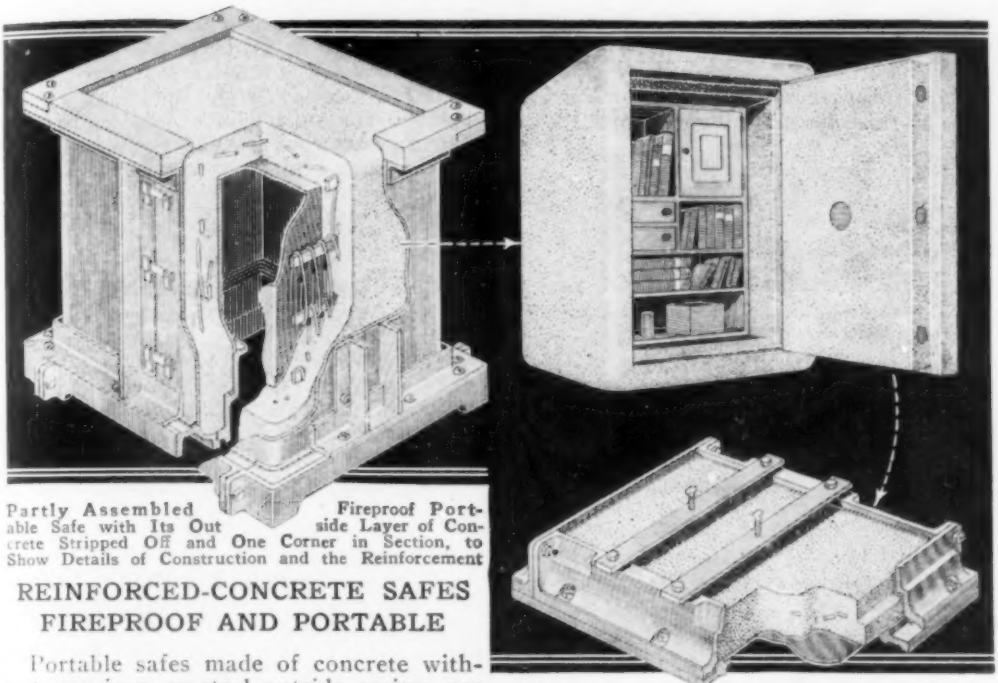
An instrument for rapidly determining the correct inclination of surfaces, in degrees and minutes, consists of a circular scale numbered from zero to 90 in four series, so that the circumference of a circle, 360 degrees, is represented. On the inside of the scaled circle is a free-swinging pendulum which has a scale in minutes, from zero to 12. When the instrument is placed on any surface, the position of the pendulum, which always hangs perpendicularly, automatically indicates whether the surface is level, or gives the degree of its inclination to the horizontal.

AUTO PANTRY BOX ON REAR LUGGAGE CARRIER

Intended as a convenient means of carrying food and provisions on auto trips, a pantry box has been made which is fastened on the rear luggage carrier. The box, a foot deep at the base and 28 inches high, has a curved felt-padded back which fits snugly to the back of the car. The front of the closet is equipped with a hinged brace and drops down, forming a table for four. Of the 13 compartments for supplies and kitchen utensils, four have specially inclosed drawers for bread, coffee, sugar, and flour.



In the Illustration to the Left, the Pantry Box is Shown Open for Luncheon. On the Right, the Box is being Taken Off at the End of a Trip. Note the Padded Back



Partly Assembled Fireproof Portable Safe with Its Outside Layer of Concrete Stripped Off and One Corner in Section, to Show Details of Construction and the Reinforcement

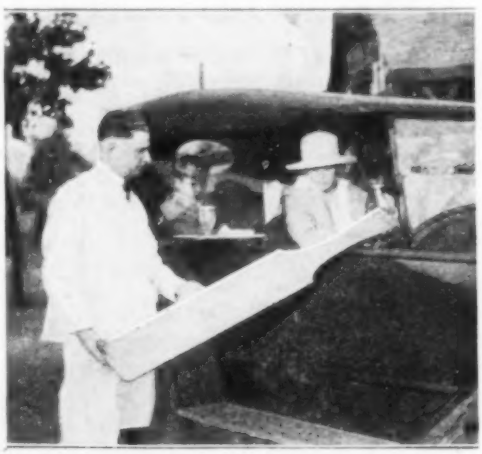
The Door of the Safe with Parts Cut Away to Show Its Construction: As Indicated by the Arrow, the Finished Door is Shown Immediately above It, in the View of the Completed Safe

REINFORCED-CONCRETE SAFES FIREPROOF AND PORTABLE

Portable safes made of concrete without any iron or steel outside casing, are now in use in Germany, and are also being exported. These small safes are said to possess all the advantages in respect to their fireproof and insulating qualities that are possessed by large concrete vaults. Securely connected to an iron base are four upright corner pieces formed of rectangular iron plates stiffened with angle irons. These meet at the center of each side of the safe, and form continuous walls. Inside these walls similar corner pieces, secured to the base, form the interior lining of the safe. The space between these two iron walls is filled with reinforcing rods of various kinds. For the strongest type of safe these are made of spirals hanging on horizontal rods. In lighter types, the spirals are omitted, and crisscrossed rods are used. Onto this construction, and inclosing it, concrete is poured so as to form a monolithic structure with outside concrete walls, giving the safe better protection against fire than is afforded by iron or steel casing that expands greatly, or even melts, at high temperatures.

SPECIAL BOARDS ENABLE CAFÉ TO SERVE PATRONS IN AUTO

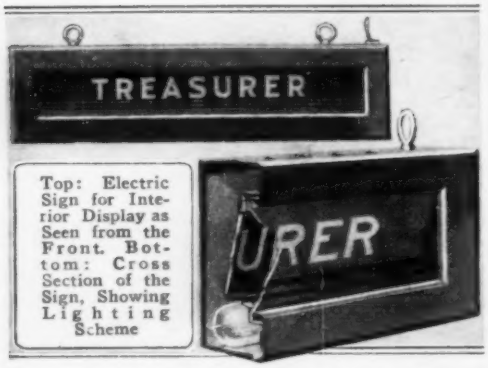
For motorists who prefer eating lunch in their cars, a roadside café near Los Angeles, Calif., has adopted specially constructed boards so that its auto patrons may be served without leaving their seats. The boards are of two types, the one designed for the front seat being fashioned at the end to fit under the steering wheel, while the second, intended for the rear seat, is of even width throughout. Three-ply maple is the wood used, and the boards are left unpainted so that they may be easily cleaned.



Waiter About to Put in Place the Specially Constructed Board for Serving the Auto Patrons of a Roadside Café

ATTRACTIVE ELECTRIC SIGN FOR INTERIOR DISPLAY

An attractive electric sign for interior display has been produced and should



Top: Electric Sign for Interior Display as Seen from the Front. Bottom: Cross Section of the Sign, Showing Lighting Scheme

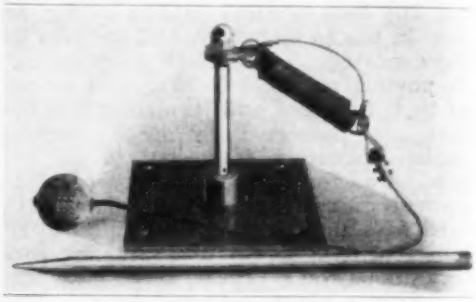
prove efficient for stores, hotels, banks, or wherever it is desired to designate different departments for the aid of the public. The sign possesses a two-way lighting feature. This is accomplished by flooding the face of the letters with light from an aperture below them, just over the lamps, and by a reflector at their rear, which causes the light to shine through them. Due to this double illumination of the white-glass letters, they stand out in unusually clear relief against the black background.

NEW PASSENGER LOCOMOTIVES ARE LARGE AND POWERFUL

A number of locomotives which are the largest and most powerful, of the simple engine type, ever built for passenger service have recently been delivered to a western railroad. The wheelbase of the engine and tender combined is 82 feet 2¾ inches and the total weight of engine and tender is 644,600 pounds. The steam cylinders are 28 inches in diameter and have a 30-inch stroke. The maximum tractive power is 66,600 pounds when operating at 210 pounds per square inch boiler pressure. The furnace is equipped with automatic stokers for burning soft coal, of which the tender can carry a 20-ton supply. The capacity of the water tank is 14,000 gallons.

MEANS FOR PRACTICING GOLF AT HOME, INDOORS OR OUT

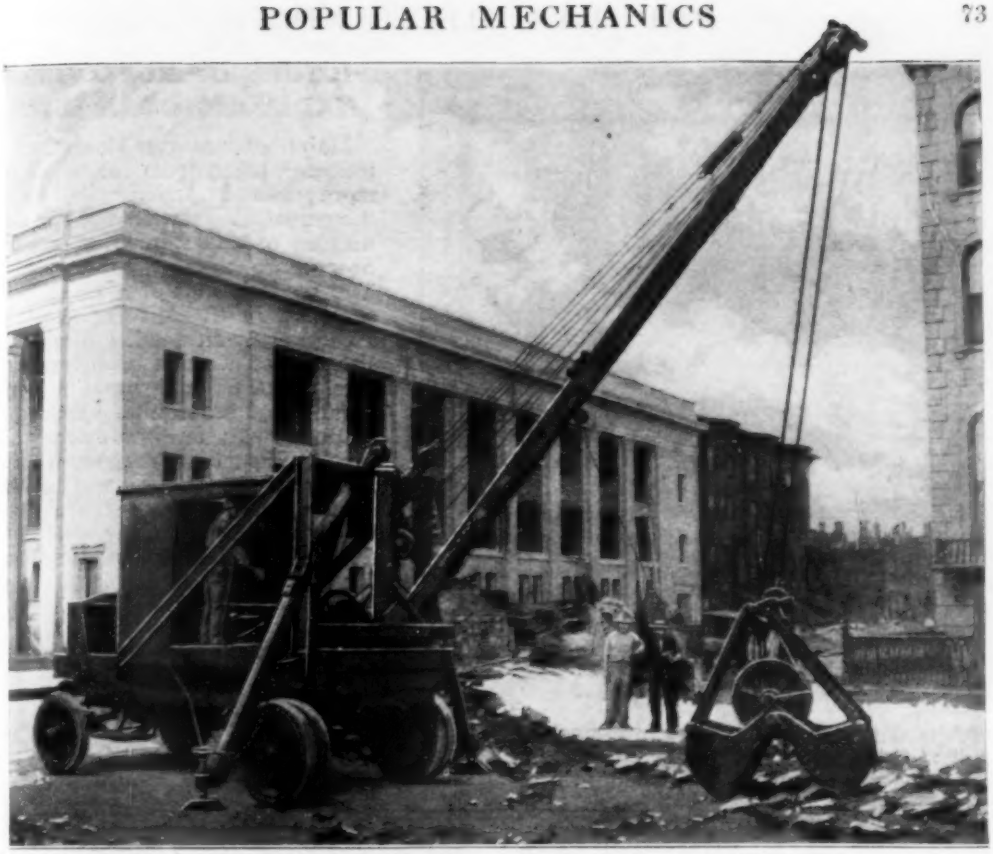
To satisfy the demand for a simple golf exerciser, a machine has been devised for practicing golf strokes at home, either indoors or out. It consists of a square steel base into which is screwed a steel post. Held in place at the top of the post is a small revolving plate to which are connected two highly tempered coil springs, which are fastened at their opposite ends to a clevis. Swiveled to this is a piece of airplane wire, which at its other end is attached securely to a golf ball. The ball, when struck from the ground or a tee



Machine for Practicing Golf Strokes at Home: Indoors, It is Screwed to the Floor; Outdoors, the Spike beside It is Attached and Pushed into the Ground

swings around the base for a length of time that varies with the nature of the stroke.

This Is One of a Number of Similar Locomotives Which Are the Largest and Most Powerful, of the Simple Engine Type, Ever Built for Passenger Service. It Has a Drawbar Pull of 66,600 Pounds, and is Equipped with Automatic Stokers for Burning Soft Coal



This Locomotive-Type Crane can be Mounted on Any Five-Ton Motor Truck Measuring at Least Nine Feet from the Back of the Driver's Seat to the Center of the Rear Axle. Nearly Worn-Out Trucks can be Used for This Service

LOCOMOTIVE-TYPE CRANE IS MOUNTED ON MOTOR TRUCK

Any five-ton motor truck, measuring approximately 9 feet from the rear of the driver's seat to the center of the rear axle, can be converted into a locomotive-type crane for service on many construction jobs, by means of equipment now available. The new attachment is built mostly of steel and has a four-cylinder gasoline engine, developing 30 horsepower, for swinging and raising the boom and for operating a hoisting hook, or any standard half-cubic-yard grab bucket weighing not over 200 pounds. The crane, unmounted, weighs six tons, and outriggers with jacks insure its stability when handling loads. Many motor trucks, too badly worn for most purposes, can be utilized to render satisfactory service with this additional piece of equipment.

¶ Wire wigs for women, constructed of the finest wire and tinted to any desired color, are said to be the latest fashion in Paris.

AUTOMOBILE LIGHT SIGNALS BOTH SAFETY AND DANGER

Among the numerous modifications of automobile rear safety signals, one recently designed has the special feature of displaying continuously, under normal running conditions, a green safety light. As soon as an emergency requires the release of the clutch, or the application of the brake, the green light is automatically displaced by a red one, indicating danger. Besides the light, there are arrows on the signal lamp that flash red to show whether the car is about to turn to the right or left. When the car is at a standstill, the red light serves as a parking lamp.

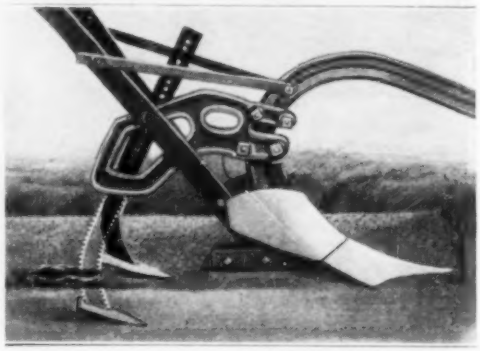
The Picture Shown Here was Made Almost Entirely from Human Hair Contributed by 40 Individuals, All Members of the Same Family. The Fence in the Foreground and a Few Other Details were Made with Bits of Wood

PICTURE OF RURAL LIFE MADE OF HUMAN HAIR

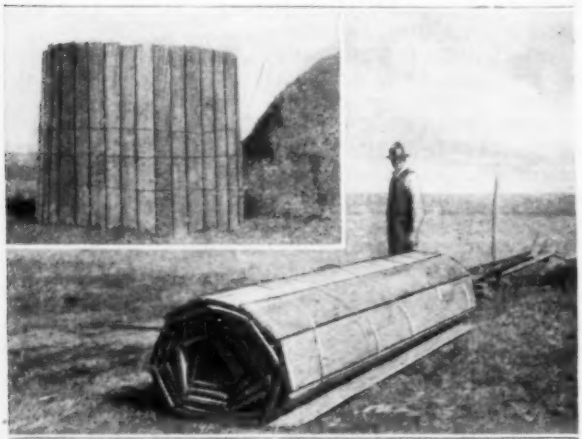
Hairs of various shades and textures, taken from the heads of more than 40 individuals, were the principal elements used in the making of an interesting picture now more than a century old. The scene is that of a small lake showing, in the left foreground, a country homestead, and, opposite, across a crude bridge, a village. In the background is seen a range of mountains apparently done with an impressionistic touch. Except for the sky, water, a few fence sticks, and other details, the entire picture was made with human hair, all contributed by members of the same family.

SUBSOILING ATTACHMENTS FOR ANY KIND OF PLOW

Attachments for breaking up the subsoil, which can be connected to any standard right or left-hand, wood or steel-beam walking plow, as well as to sulky plows, are now on the market. For connection to a steel-beam plow two U-bolts, and for the wood plows, two clamps, are provided. For sulky plows only two bolts are required. The subsoiling is done with two steel blades, which can be detached to be resharpened. The attachment is adjustable so that the subsoiling can be done to any desired depth.



Subsoiling Attachment Connected to a Steel-Beam Plow: Dotted Lines Show How It can be Adjusted



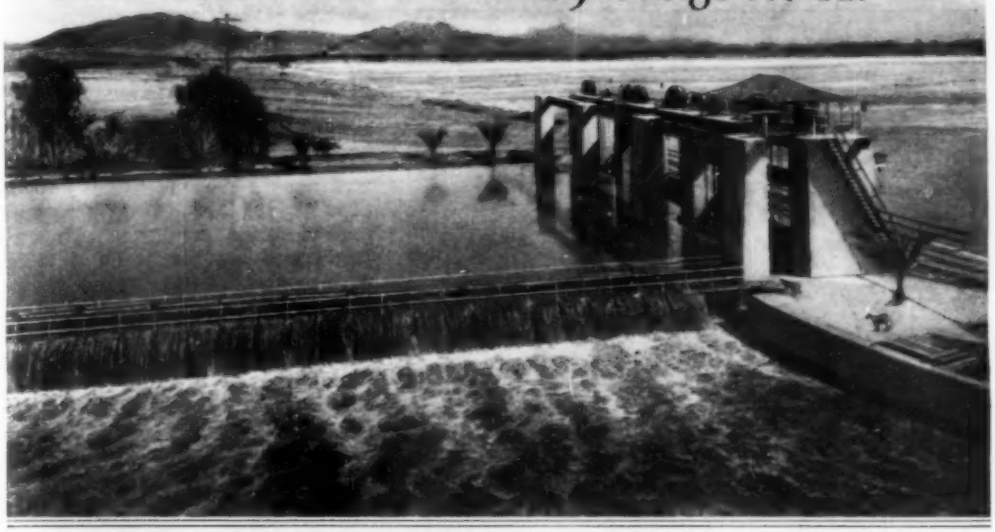
Demountable Grain Bin after being Emptied, Taken Down, and Rolled Up in Readiness to be Transported to the Storehouse: Insert Shows the Bin Set Up Ready for Use

KNOCKDOWN GRAIN BINS OF WIRED BOARDS

Demountable wooden bins have been introduced as a successful and economical substitute for the light galvanized-iron containers commonly used by the grain growers of the Northwest. The new bin is made up of 1 by 8-inch boards, from 6 to 8 feet in length, which are placed side by side and fastened together by wires, which are stapled to each unit. By using a greater or less number of boards, bins of any capacity may be built. The finished product may then be readily set up in any desired location for the reception of grain.

RECLAIMING YUMA LAND

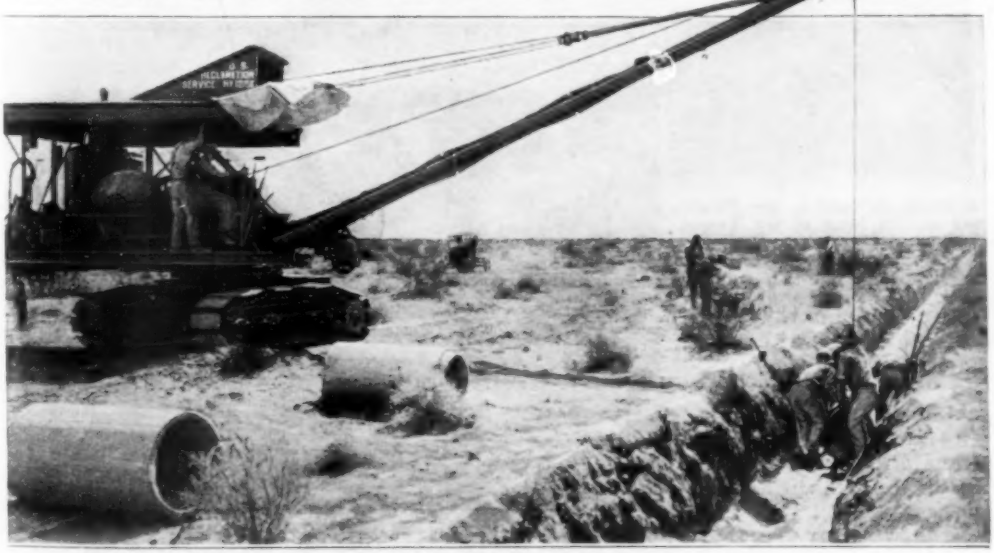
By George F. Paul



Laguna Dam, Sluiceway, Canal, and Control Gates on the Yuma Land Irrigation Project in the Arid Section of Southern California, Now being Pushed to Completion by the United States Reclamation Service

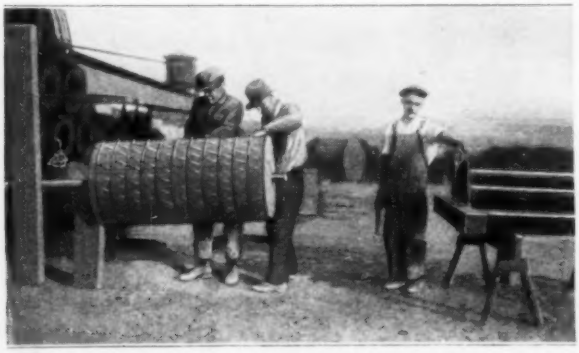
IN reclaiming the great Yuma Mesa—generally conceded to be the hottest part of the United States—more than 20 miles of concrete pipe, from 15 to 45 inches in diameter, is being used. This is merely for the first unit, or 6,000 acres, of a total area of 40,000 acres that will be irrigated. This unit of 6,000 acres is divided into 150 orchard tracts of 40 acres each. Before the orchards are planted, there will be required for each tract about one mile of 15-inch pipe, or 150 miles for the entire unit; this is in addition to the 20 miles comprising the main system.

The mesa has a year-round growing season and a productive soil that is particularly adapted for growing citrus fruits. The fruit



Laying 18-Inch Concrete Pipe with a Dragline Excavator on the Mesa of the Yuma Land Project: In This Manner One-Quarter of a Mile of Pipe was Laid and the Joints Sealed Every Day

matures several weeks ahead of that grown in other sections of the Pacific-coast region. The irrigable area is from 80 to 215 feet above sea level and has a



Fabricating the Reinforcing Mesh for a Section of Concrete Pipe Used on the Yuma Land Project; Raw Materials for Concrete Are Plentiful in This Region

temperature range of 22° to 118° F. The soil of the valleys is a rich alluvium, and of the mesa, gravelly sand. The annual rainfall does not amount to much, averaging about 2.5 inches. A real rain is a genuine treat; hence, irrigation is the only method of producing crops on this arid soil that is baked for months under the summer sun. However, with abundant water coming, there is a wondrous transformation and the land commands big prices.

The work of manufacturing these miles of concrete pipe is under the direction of the U. S. Reclamation Service. Raw materials are plentiful in the region, and the main plant has been laid out so as to handle them readily. Bucket conveyors carry them to the screening tower, where they are graded by a rotary screen. Conical buckets, operating on gantry cranes, distribute the concrete to the molds. Chain hoists make it an easy matter to pour the concrete and handle the molds. When the pipe units are ready, they are loaded onto trailers. An endless-tread tractor pulls a string of eight trailers several miles over the sandy roads to the point where the work of pipe laying is in progress. A dragline excavator is used for laying the pipe. With this arrangement, good progress is made, more than a quarter of a mile of pipe being laid and the joints sealed every day. For handling the pipe a special clasp of the "clothespin" type is used, which greatly reduces breakage.

What irrigation is doing for the development of the Yuma district can readily be seen from the fact that in 1900 there were 100 bank depositors; today there are more than 10,000, and the number is steadily growing, thanks to the fact that water is turning the desert into a highly productive garden.

A Citrus Orchard in the Planting on the Mesa of the Yuma Irrigation Project, in Southern California

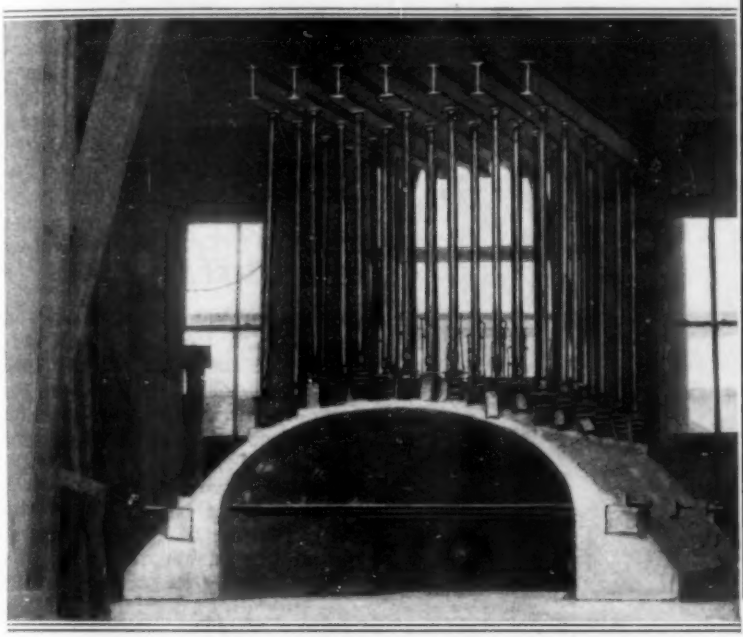
Six-Year-Old Orange Grove on the Yuma Mesa: A Total of 40,000 Acres has been Laid Out in 6,000-Acre Units, Which are Subdivided into 40-Acre Orchards

MEASURING SKEW-ARCH STRAINS AND STRESSES

There has always been considerable uncertainty as to the distribution of stresses, and especially as to the thrust at the abutments in a skew-arch bridge; that is to say, an arch which crosses a roadway diagonally, and thus has its abutments not directly opposite each other.

In order to determine the nature and the amount of these stresses positively, the Bureau of Public Roads, at its Arlington Experiment Station, near Washington, has under way a series of experimental tests to be made upon a model of a skew-arch bridge, one-quarter the size of an actual structure, and having an arch 7 feet in span, 4½ feet in width from face to face, with a height of 4 feet above the base of the abutments. The crown of the arch is 2 inches in thickness, and the arch barrel is reinforced with ¼-inch bars. At the springing line of the arch, the abutments are tied together with a number of parallel rods, and two diagonal ones that resist distortion of the arch in any direction.

For determining the effects upon the arch of a known dead load, 42 spiral springs are uniformly distributed over the top of the arch, each capable of carrying a load of 1,500 pounds, resting upon a flat concrete boss, and carrying above it a vertical 2-inch pipe that bears against a solid overhead I-beam structure. By means of an adjusting screw at the end of the pipe, the load applied to any one spring can be adjusted as desired. The strains and the distribution of the stresses resulting from a gradual increase of the loading, will be measured with great precision by an instrument known as a strain gauge. From the results of a series of these tests, it is believed that enough information will be obtained to enable the engineer to formulate rules for the economical design of skew arches. By observing the stresses in the tie-rods, the thrust on the abutment will also be measured. In addition, observations will be made of any deflection or distortion of the arch. In this manner the arch will be tested to destruction.



Method of Testing a Skew-Arch Bridge: Any Uniform Load is Applied by Means of the 42 Springs under the Pipes That Bear against the Overhead I-Beams. To the Right, One of These Springs is Shown Enlarged; the Tie-Rods between Abutments Are for Measuring the Thrust

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¶ An international chain of weather stations along the arctic circle is being proposed by the United States Government. Experts say that the stations would increase the range of reliable forecasting to two weeks, practically doubling the efficiency of the service.

OLD BRICK CHURCH RESTORED WITH VENEER OF CONCRETE

Converting an old red-brick church, in Detroit, Mich., into a new white concrete one, in appearance at least, has been ingeniously done in preparation for the fiftieth anniversary of the completion of the church. Scaffolding was erected around the old building; all the exterior dirt, paint, and defective brickwork were chipped away, leaving a rough, clean surface upon which a layer of cement was spread, and then, when dry, tooled to look like concrete blocks. Passers-by who do not know of this ingenious renovation, are at a loss to reconcile the date—1872—on the cornerstone with the extremely new-appearing concrete exterior. Even to the oldest residents, this complete change is somewhat bewildering.

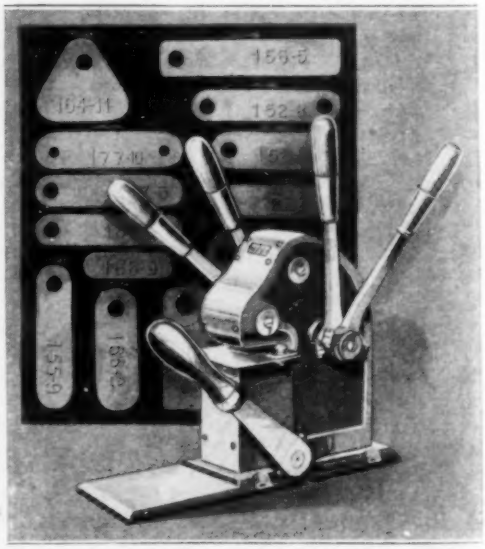
Red-Brick Church in Detroit, Michigan, 50 Years Old, That has been Veneered with Cement and Made to Look like a Church Built of Concrete Blocks

CEMENT FLOOR BLOCKS SERVE AS MEASURE IN STORE

A most convenient measure, 32 feet long and 2 feet wide, is available at a hardware store in Los Angeles, as a result of a contractor's foresight in laying the floor. Realizing that great lengths could not easily be measured on the counter, he laid the cement floor with blocks exactly 2 feet square. An aisle immediately in front of the counter is now always kept clear, and wire netting, rope, clothesline, chicken wire, and other bulky things sold by the foot or yard, are simply laid on the floor and measured by the squares. The government inspector of measurements for the district has officially approved the method.

NOVEL METAL-TAG MARKER IS A TIMESAVER

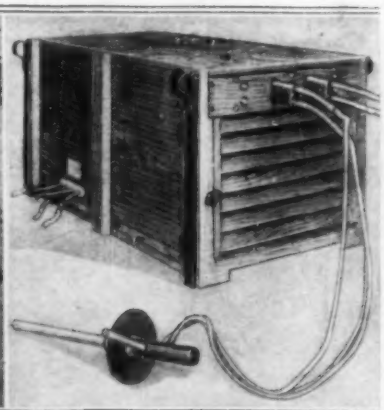
A new device for stamping embossed figures on metal tags used in many factories, produces the entire number in one operation, insuring positive alinement of figures and saving considerable time. The figures to be embossed are set by means of four levers, in the same manner as a cash register is operated, and, as selected, appear in a window at the front of the machine. This feature of visibility minimizes the possibility of errors. The embossing is done quickly in one operation by simply pressing down a fifth lever, located at the bottom of the machine.



This Metal-Tag Marker Embosses the Entire Number at One Operation, Resulting in a Better Job, as Well as in Saving of Time and Labor

ELECTRIC-ARC CUTTING TOOL FOR RIVETS

Tool in Use, Cutting Up a Propeller Blade: One Cut Is Completed and the Second Is under Way



Welding and Cutting Transformer Shown in Connection with the Handle, Which can be Operated with One Hand

The Arc Cutting Tool being Used in Cutting Out Rivets by Melting Off Their Heads

For cutting any metal, and particularly for rivet cutting, there is now in use a specially designed electric - arc cutting machine. It is used for cutting up scrap, such as sections of cars, boilers, or tanks, to chargeable sizes, and will economically cut through any thickness under 6 inches. It will cut out more than 100 rivets per hour, at a very low cost per rivet. The tool is provided with a handle constructed to protect the operator in the holding of an electrode that will carry a current up to 1,000 amperes. The current is controlled by a special transformer which is portable, and may be placed indoors or out. In any location, it is proof against an atmosphere of dust or dirt. It is provided with ducts through which air is driven by means of a special bucket-type ball-bearing blower.

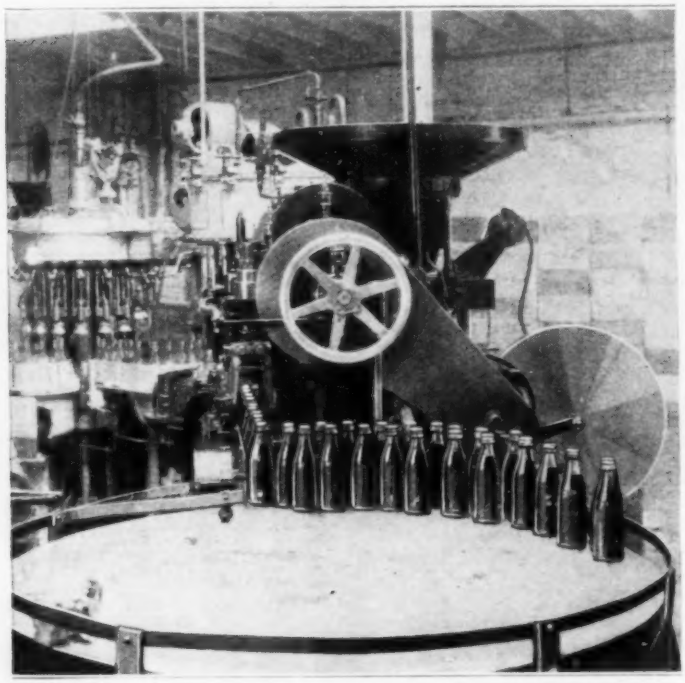
COUPÉ LANDS BOTTOM UP IN ODD ACCIDENT

Shooting along a California highway at a good rate of speed recently, the front wheel of a coupé caught in an obstruction at a turn in the road. A moment later the car was standing, bottom side up, balanced on a small mound of earth to one side of the roadway. There were four passengers in the car at the time of the accident, but none of them sustained injuries. Neither was the body of the car seriously damaged. Recovering from the shock, the occupants righted the auto without mechanical aid.

The Coupé Above Landed in This Queer Position after Hitting an Obstruction in the Road. It had been Traveling at a High Rate of Speed. No One was Injured

BOTTLES CORKED AND SEALED BY NEW MACHINE

Corking and sealing bottles as these come from the automatic filler at the rate of 5,000 an hour, is possible with the use of a recently produced machine. Large hoppers on the outfit are filled with thin disks of cork or paraffined paper, and a strip of aluminum is fed from a coil. In operation, the machine places the cork or paper disk on the bottle, after which the aluminum seal is fastened on the containers, everything being done automatically.



Automatic Bottle-Sealing Machine, Showing the Strip of Aluminum being Fed from the Coil at the Rear, While, at the Top of the Outfit, may be Seen the Large Hopper for the Cork or Paper Disks

ALLOY-STEEL GRATE BARS PROVE ECONOMICAL

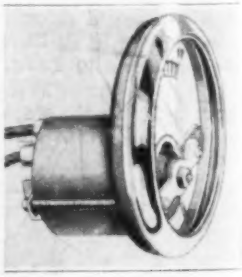
Heat-resisting steel castings are reported to have been developed that indicate substantial savings as a substitute for the conventional cast-iron grate bars. The higher cost of the alloy steel is largely offset by the fact that the grate bars can be made 25 to 40 per cent lighter than those of cast iron. They are said to last much longer than the iron bars, and are not subject to change of shape as is the case with cast iron. An American vessel has tried the bars with success.

MAKING TURBINES NOISELESS BY MEANS OF INSULATION

In spite of great precautions in connection with the cushioning with cork and sand of the concrete-block foundations, it was at first found impossible to prevent high-speed turbines from transmitting vibrations to the superstructure of a large hotel where the hum of the turbine could be heard in many rooms. Upon investigation, it was found that in pouring the concrete blocks, the cement had leaked into the cork and sand, thus destroying their insulating qualities. These defective foundations were torn out, and on the leveled surface of the bedrock a four-sided inclosure was built with 8-inch waterproofed brick walls. Alternate 2-inch layers of hair felt and compressed cork were placed on top of the bedrock, and were formed as a complete lining to the inside faces of the brick walls. After this was waterproofed with felt and pitch, the concrete was carefully poured into the inclosure. The result was that not a sound from the turbines could be heard even in the room directly above them.

TINY METERS FOR RADIO SET FIT PANEL PEEPHOLES

Tiny ammeters and voltmeters, which fit any radio-panel peepholes, from 25/32 inch in size and up, are now available. They may be used with either alternating or direct current, and two types now on the market have ranges of 0 to .8 ampere with 0 to 6 volts, and 0 to 1.2 amperes with 0 to 10 volts. The meters are attached by long bolts to the rear of the panel and give added protection for costly vacuum tubes.



George Farrar, 12 Years of Age, Who Learned to Speak by Radio

Making the Deaf Hear and the Dumb Speak by Radio

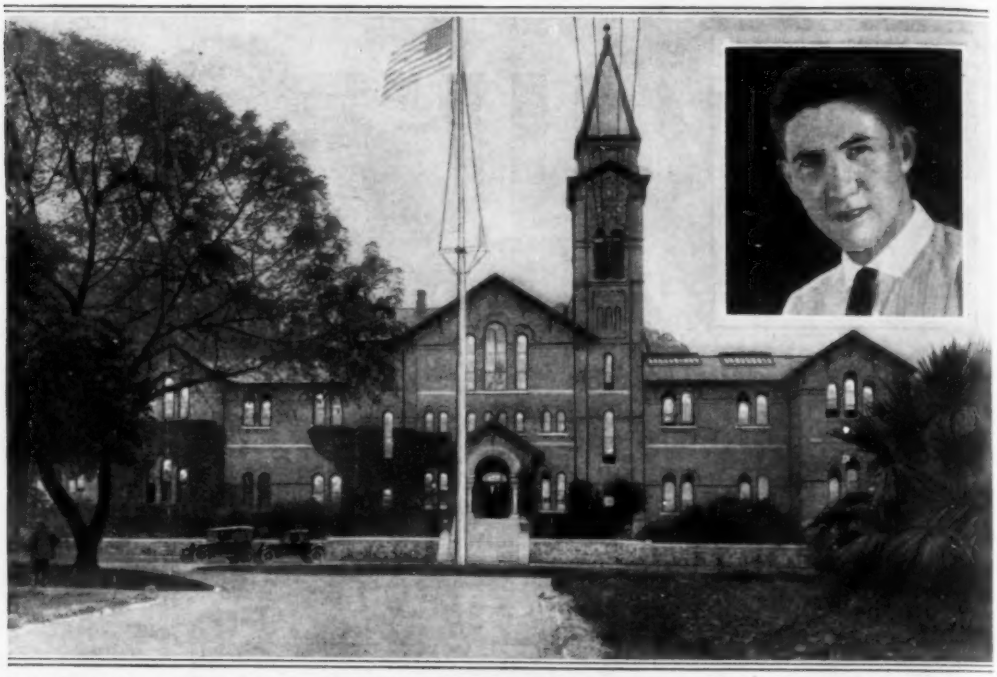
By H. H. DUNN

WHILE some of the greatest scientists of the world are devoting their earnest attention to the perfecting of radio for the use of those who possess all their faculties, out on the Pacific coast a little group of men have been adapting it to the betterment of the conditions of those who are deprived of the ability to hear or to speak. Under the direction of J. S. McCullough, superintendent of the California State School for the Deaf, Dumb, and Blind, at Berkeley, this work has been brought to such a stage that young men and women who never have spoken a word in their lives are beginning to talk. Miniature amplifiers and more refined and delicate diaphragms in the earpieces on the receiving sets have enabled boys and girls, born deaf, to hear and enjoy radio concerts, lectures, and even to have explanations of their lessons given to them through the medium of the wireless.

This remarkable work has been carried on with homemade apparatus, a large part of it constructed and adapted by Carol Land, a young graduate of the school. Land, though born deaf and dumb, has learned to speak fluently and in a well-modulated voice, through "listening" in, with his deaf ears, on radio, and is now one of the heads of the school's department for the deaf.

According to Mr. McCullough, the secret of the aid given the deaf by radio is that it sends out more accentuated vibrations than the human voice. While many deaf persons receive and perceive sound through their fingers, especially by placing them on the lips of speakers, just as blind persons have been trained to use their more sensitive fingers in place of their eyes, the radio carries a stronger vibration to the ear in which the drum is not entirely wanting, and impels the dormant nerves of hearing to transmit these augmented sound waves to the brain. In cases in which the eardrum is present, but "dead," this can be done, and is being done every day at the California school, but when the eardrum is absent, the radio, of course, has no effect.

The reason that many deaf persons also are mute, is that their so-called dead eardrums cannot pick up the vibrations of noises and translate them into understandable sounds. Their eardrums, however, can "feel" the more powerful vibrations and waves of the radio receiver, and, gradually, the nerves resume their functions, and the brain begins to translate the sounds received. Then, as the deaf begin to receive the sensations of sounds and to connect them with letters and words which they know through reading them with the eyes, they begin to try to imitate them with their unused vocal cords. Sometimes it is a slow process, but almost always they succeed. At first, their voices are uncontrolled,



State School for the Deaf, Dumb, and Blind, at Berkeley, California, Where Many Remarkable Results have been Obtained by the Use of Radio: The Insert Shows Carol Land, a Graduate of the School, Who has been Taught to Speak by Means of Radio, and Who Now Is an Instructor in the Department for the Deaf

their tones variable, and their pronunciation uneven, but eventually they learn to speak. They cannot hear their own voices, unless they hear them as spoken into the radio sender and then taken up by them at the receiving end, but a number of the boys and girls who were both deaf and mute a few months ago, are now speaking in good voices, and have had a new world opened to them.

The apparatus used is simple, in fact, all of it was made at the school, with the exception of the extra-loud amplifiers, which are hooked in between the coils and the earpieces, and of the unusually thin diaphragms in those earpieces, so that the vibrations sent against the dead eardrums may be as strong as they can be made. There is no new invention in the work, and Mr. McCullough believes that a very great majority of the deaf throughout the world could have a new field of enjoyment, education, and opportunity opened to them by this means. He also believes that all those mutes who have not totally lost their eardrums, and whose vocal cords have not become atrophied, could be taught to speak by the use of an ordinary radio outfit.

One of the most interesting examples of the pupils of the school who have learned to speak through use of the wireless, is George Farrar. This boy, 12 years of age, had been deaf and mute from birth. When Mr. McCullough, at the beginning of his experiments, asked him to listen in on the radio, he began the work earnestly. For nearly two weeks there was no result. Then, suddenly, one afternoon, the long-continued and heavy vibrations of the radio waves began to do their work, and the boy heard the first "noise" he ever had heard in his life. He did not know what the noise meant, but he continued listening in, and as he kept up this work, hours at a time, he heard other sounds, and began to distinguish between different sounds, often repeated, though he did not know what they meant.

Mr. McCullough does his own broadcasting, locally, from a sending plant in his own office. In a loud, clear voice, he repeats the same word, time after time, until the children become familiar with it. Each day he writes out for them the words he is to give them, in the order in which they will be broadcast. As they come to recognize these sounds, they check them off their lists, and new words are given, with regular radio examinations and tests every few days on the sounds they already have had. The alphabet is handled in the same way.

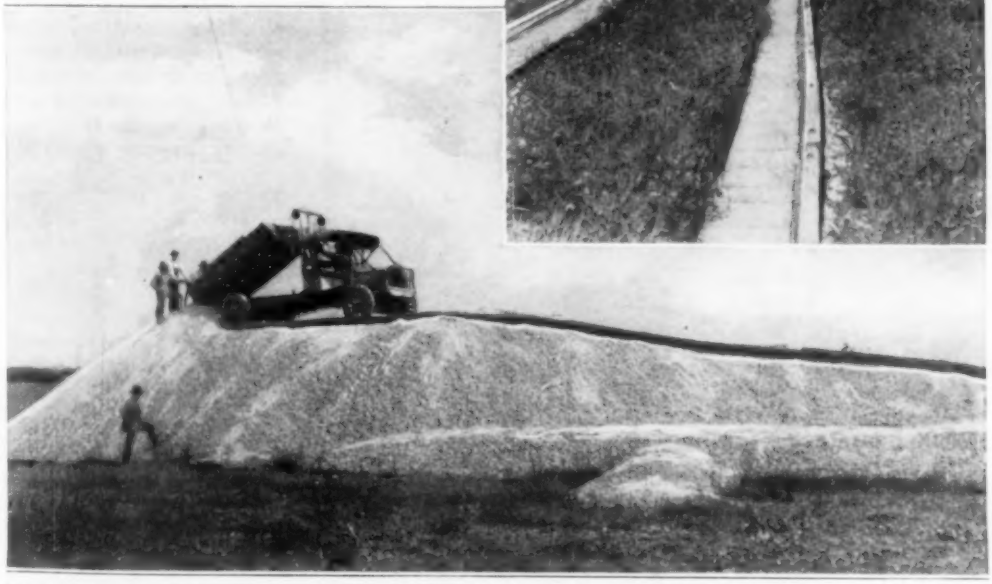
One day little George Farrar looked up from his lists and saw an animal running across the campus of the state

school. He leaped up and shouted "dog," the first word he ever had spoken in his 12 years of life. His tone was loud and rather strident, but he was soon taught to modulate that. Since that day he has acquired a considerable vocabulary — of sounds, for he knew words before. Today he can carry on an extensive conversation about school matters, his lessons, and some outside subjects, in a nearly normal voice.

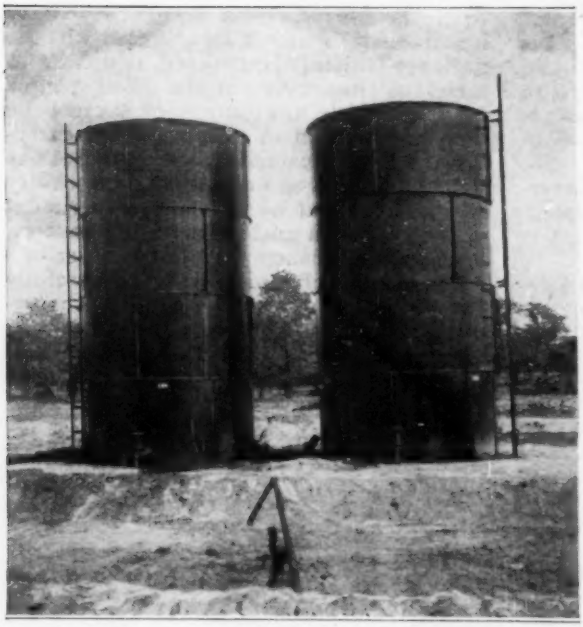
Few of those who have learned to receive and register impressions of sounds from the radio have failed, eventually, to learn to speak. Some have difficulty in controlling their voices; some are slow to form words, even after they have heard them many times, but with the patience which is being used, and the tremendous improvement in their fellow boys and girls, the efforts of these little men and women of tomorrow are carrying them to greater fields of opportunity through improved hearing and the ability to speak. What was once an experiment at the school is no longer an experiment, but an established part of the school work, the results of which are carefully recorded and studied so that these records may form the basis of other and more advanced work, as the knowledge of radio and its utilization develops.

HEAVY TRUCKS USED TO BUILD HIGH STOCK PILES

Stock piles of bulk materials can be built up with heavy trucks, according to the method used by a highway-construction superintendent who provided runways in 10-foot units made interchangeable and of such weight that two men could easily handle one unit. A unit is built up of two 4 by 4-inch timbers laid parallel on 12-inch centers, on top of which are spiked 2 by 12 by 16-inch planks, so that the ends of the planks come flush with the 4 by 4-inch timbers, and a 4 by 4-inch timber bolted to the top of the planks, at the outside edge, forms a guide for the truck wheels. The units are fastened together with ¾-inch hooks and eyes, the lateral hooks being of a length to give the proper gauge to the track.



Above: View Showing the Runways Which are Built in Interchangeable Units, 10 Feet Long, and Laid Down for the Truck Used in Building the Stock Pile. Below: Side View of the Stock Pile, Showing Truck Dumping a Load of Crushed Stone



These Storage Tanks are Built with a Smaller Diameter and Greater Height than Usual, So That Surface Evaporation is Greatly Eliminated

SAVE OIL WITH NEW TYPE OF STORAGE TANK

Storage tanks with a smaller diameter and greater height are an important factor in decreasing evaporation, according to a Texas oil company, now busy installing the newer design. The smaller surface of the tank, it is claimed, overcomes to a large extent the usual loss from this cause. Another special feature in the construction is the arrangement of 16 incoming pipe lines, which are run down the inside to within a few inches of the bottom. This method serves to lessen the evaporation which would otherwise occur with the surface being constantly disturbed by the flowing in of oil at the top. The tanks are 19 feet high, have a diameter of 10 feet, and hold about 10,000 gallons. The old construction, it is estimated, resulted in a loss of about 20 per cent of the contents.

WOMAN MAKES HOME BEHIND DISPLAY WINDOWS

Entertaining Callers in Her Home behind Store Windows: Onlookers Seem to Be Much Interested

People who actually live in "glass houses" are not easily found, but America has one such in the person of a young woman whose living quarters at present consist of a three-room suite behind department-store windows. The rooms are equipped with whatever home furnishings the store wishes to advertise, and the young woman has no other duty than to make herself at home. She has her meals, reads, receives callers, plays the piano, sings, and passes the day much as an ordinary housewife would.

Here the Young Woman is Seen with Her Hairdresser, While to the Right may be Noted a Portion of the Large Crowd Gathered Outside to Watch Her Activities

At the Railroad Trestle near the St. John River in New Brunswick, Canada, Where the Runaway Logs and the Bridge were Finally Stopped: The Force of the Jam Was So Great at This Point That the Steel Bridge was Bent over the Trestle, While the Trestle Itself was Pushed Four Feet Out of Alinement

MOVES OF SLEEPER RECORDED BY BEDPOST APPARATUS

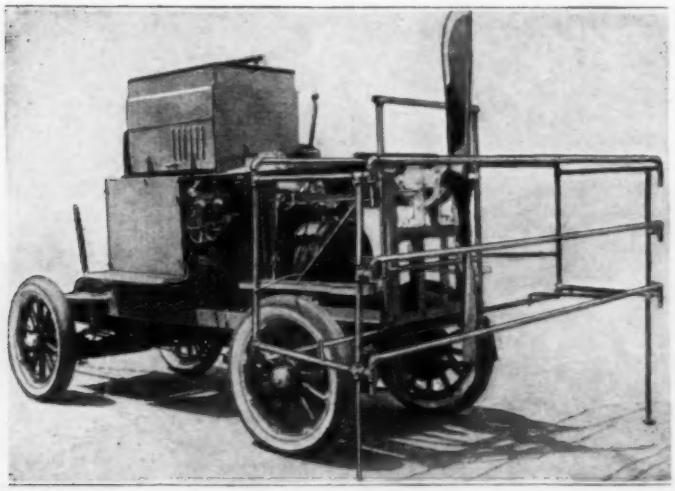
Recording continuously the slightest movements of a patient in bed and thereby determining the hours of complete and untroubled rest he has had, is an idea introduced by a German physician. This result is obtained by first placing a sheet of rubber beneath one of the bedposts and attaching special apparatus to the post. The apparatus consists, briefly, of a lever, one end of which is fastened to the bedpost, the other having a recording pen affixed to it. Underneath the pen is located a clockwork drum containing a chart divided into 24 hours, so that a continuous curve of the sleeper's movements is kept and may be consulted if it is desired to ascertain how he has rested, or to convince a patient that he has underrated his hours of rest.

RUNAWAY LOGS CARRY BRIDGE DOWN CANADIAN STREAM

Thousands of logs broke loose and carried a large steel road bridge down the Becaguimac River, near Hartland, N. B., recently after a continuous deluge of rain had swelled the stream 25 feet above its summer level. The logs were being held in a dam when the waters rose. Breaking booms, stone piers, and dam, they swept downstream to a steel bridge which, after a short halt, was literally lifted off its foundations and carried along. The jam was finally stopped by the Canadian Pacific Railroad trestle near the St. John River. Here the force of the impact was so great that the upper structure of the road bridge was bent over the trestle, while the trestle itself was pushed four feet out of alinement.

The Great Power behind the Thousands of Logs Piled Up in the Stream is Clearly Demonstrated by This Picture, Which Shows How the Heavy Steel Bridge was Bent over the Trestle

¶Those wishing further information on anything described in the editorial pages can obtain it by addressing Bureau of Information, Popular Mechanics Magazine, Chicago.

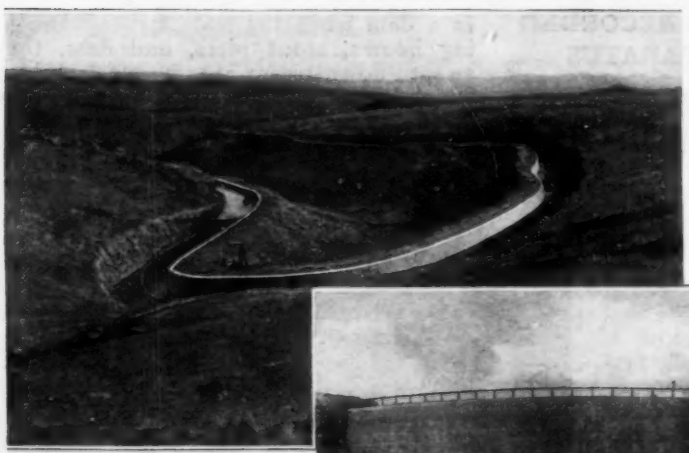


"Storm Machine," Showing the Box Containing the Arc Lights on Top, the Switchboard below This, While in Front are Seen the Generator and Propeller, with a Guard Rail around the Latter

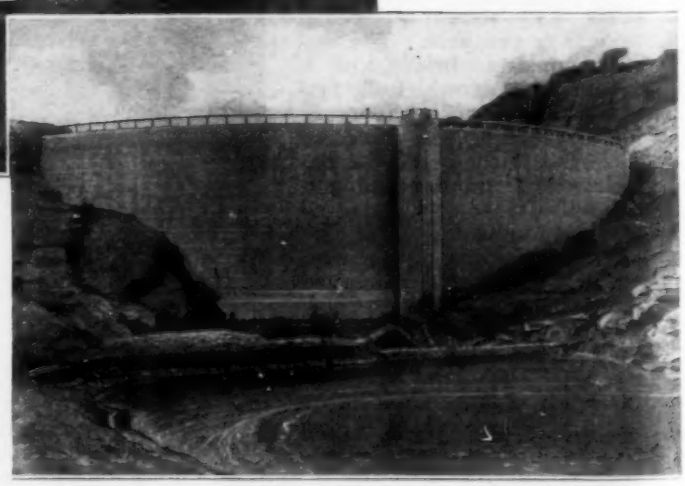
"STORM MACHINE" ON WHEELS FOR MOVIES

"Storm machines" are considered a necessity by the producers of motion pictures, one of these companies possessing an efficient and easily handled outfit which is mounted on the chassis of a motor truck. The truck engine drives a generator that furnishes current for the eight large arc lamps which produce the "lightning," while a propeller of the airplane type, also driven by the engine, provides the "cyclone" effects.

SEMICIRCULAR CONCRETE IRRIGATION DAM



Bird's-Eye View of Concrete Irrigation Dam, Showing Its Outline, Curved with a Radius of 185 Feet, and 450 Feet Long, or Nearly a Complete Semicircle



Front Elevation of Semicircular Concrete Dam, 90 Feet High above Ground and 23 Feet Deep below It: At the Ground Level It Is 25 Feet Thick

A concrete irrigation dam that is made very strong in proportion to its thickness because it is semicircular in form, has been built on one of the rivers in the province of Otago, New Zealand. The dam is 450 feet long, curved with a radius of 185 feet. It is 90 feet above the river bed, with foundations 23 feet below. At ground level it is 25 feet thick, tapering to only 4 feet 6 inches at the top. The dam is for storing water to be carried by a raceway to the head of a valley which it will irrigate, and was designed by the public-works department, so as to have a storage capacity of approximately 10,000,000,000 gallons of water.

A Departure from Conventional Lines of Architecture is Seen in This Beautiful Apartment Building Which has been Erected at Miami Beach, Florida. The Walls are Treated with Waterproofed Stucco of a Two-Tone Mottled Design. Red Tile Cover the Court and Floors of the Gallery

BALCONIES SET IN COURTYARD BEAUTIFY APARTMENT HOTEL

With the rapid development of Miami Beach, Fla., as a winter resort, there has sprung up a demand for apartment hotels of original design. One of the buildings planned to meet this demand is a splendid example of a combined Spanish and Moorish style of architecture. It has just enough ornamentation in the way of old handmade Spanish tile, wrought-iron grills, loggias, and balconies to enliven its quiet dignity.

The building is of reinforced-concrete pilaster and girder construction, with hollow-tile curtain walls. The latter are treated with two coats of waterproofed stucco of a two-tone mottled design. Stairways and gallery are of solid concrete, the floors of the gallery, as well as the walks in the court surrounding the fountain and giving access to the first-floor apartments, being covered with 6 by 6-inch red tile. Handmade Spanish tile support the gallery balustrade. Every room in the building faces either the street, the court, or a golf course, while shrubs, flowers, and tinted walls combine to give a touch of Old Mexico.

RUBBER STEP MATS CLEAVE TO AUTO RUNNING BOARD

Rubber step mats for automobiles are now being made with raw-gum backs so that they may be easily stuck in place on the running board. The chief advantages claimed for this method are the simplicity of installation, and the fact that dirt and water cannot enter under the mat. It is also claimed bulging or buckling in the center is effectively eliminated. The usual method is to screw or rivet the mats in place.

After the Paper Covering is Taken from the Raw-Gum Back of This Step Mat, the Mat is Stuck in Place

TRAVELING HOMES FOR AUTOMOBILE TOURISTS

Interior View of Automobile, Showing the Folding Bed at the Rear That Accommodates Two Persons: Near the Right End of the Bed may be Seen the Special Seat for the Convenience of the Occupants While Undressing

TRAVELING homes for automobile tourists are now being manufactured in standard models by a western motor-car company. The machines consist of a stock chassis on which are mounted special bodies. These bodies are each equipped with a gasoline stove, collapsible table, lockers for cooking utensils, combination buffet and ice box, white-enameled sink, hot and cold circulating water, writing desk, clothes closet, dome electric lights, and fire extinguishers. Also, two revolving leather chairs may be moved about the interior, these fitting into socket holes in

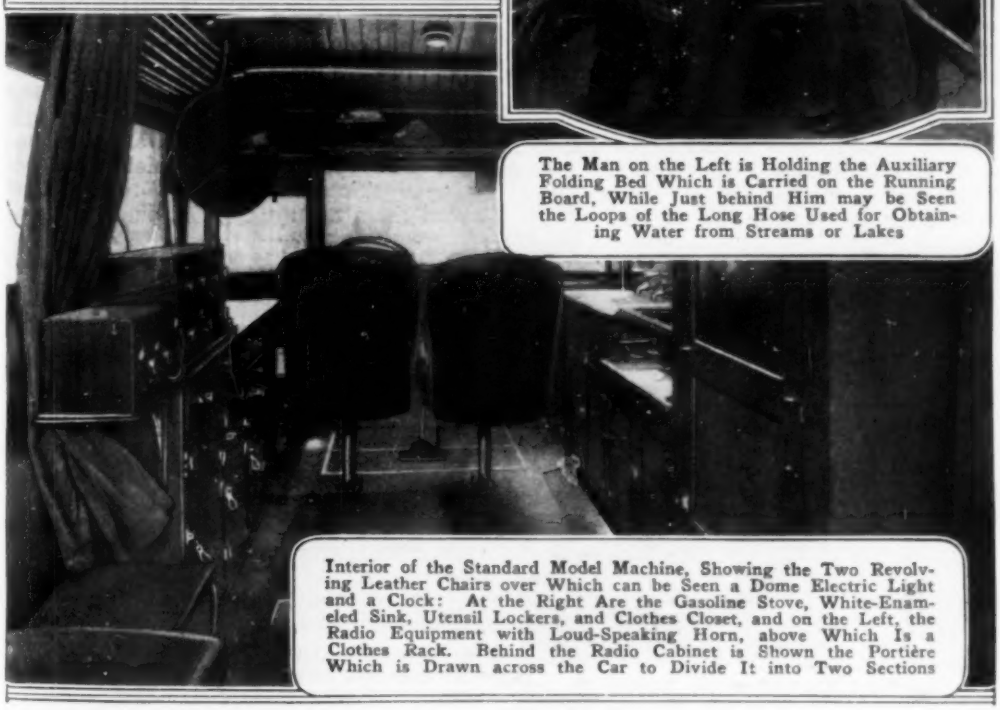
At the Top, Breakfast is being Served at the Collapsible Table. Below is Shown How the Auxiliary Folding Bed is Suspended by Hooks from the Upper Part of the Machine. This Outside Bed is Carried for the Accommodation of the Cook, or Driver, and is Easily Taken Down or Erected at the Beginning or Completion of the Daily Trip

BEING MANUFACTURED IN STANDARD MODELS

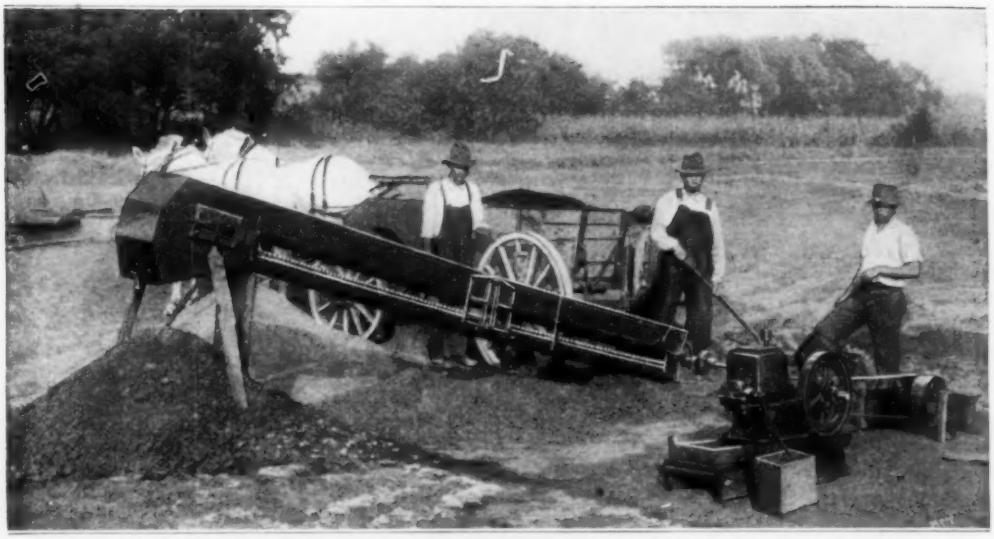
Elaborately Equipped Motor Car, Showing the Radio Antenna on the Top, and the Auxiliary Folding Bed

the floor. A folding bed for two persons, and similar to those on a railway sleeper, is incorporated in the vehicle; while an auxiliary bed, or tent, which may be erected or hung by hooks from the top of the car on the outside, is carried on the running board. Radio equipment, with a loud speaker, is also one of the features. The engine is provided with a pump so that water may be obtained from a stream or lake, through the medium of a long hose.

The Man on the Left is Holding the Auxiliary Folding Bed Which is Carried on the Running Board, While Just behind Him may be Seen the Loops of the Long Hose Used for Obtaining Water from Streams or Lakes



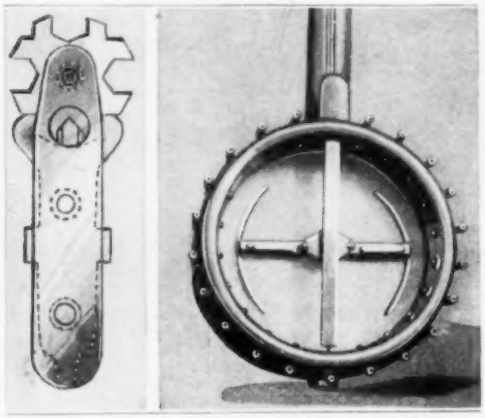
Interior of the Standard Model Machine, Showing the Two Revolving Leather Chairs over Which can be Seen a Dome Electric Light and a Clock: At the Right Are the Gasoline Stove, White-Enameled Sink, Utensil Lockers, and Clothes Closet, and on the Left, the Radio Equipment with Loud-Speaking Horn, above Which Is a Clothes Rack. Behind the Radio Cabinet is Shown the Portière Which is Drawn across the Car to Divide It into Two Sections



Sand, Soil, and Humus Mixer: In the Foreground Is the Gasoline Engine, Belted to the Shaft That Drives the Inclined Conveyor over the Screen. The Fine Particles of the Mixed Ingredients are Seen underneath the Screen, While the Lumps and Foreign Matter are Shown below the Raised End

TWO NOVELTIES FOR USE ON BANJOS AND DRUMS

Two novelties for use with banjos are a head tightener that is said to increase the volume of the tone, and a combined screwdriver and multiple wrench that fits all bracket nuts on any banjo or drum. In the tightener, two ring sections are placed under the head of the banjo so that they can be forced against it by turning two thumbscrews connected with a bar attached to the banjo head on a center line. The multiple wrench is built like a small, thin pocketknife handle, with a screwdriver blade inside it, that slides out of the handle when in use, and into it for carrying in the pocket.



Left: Combined Screwdriver and Multiple Wrench. Right: Banjo Shown Fitted with the Head Tightener

SAND, SOIL, AND HUMUS MIXER DRIVEN BY GAS ENGINE

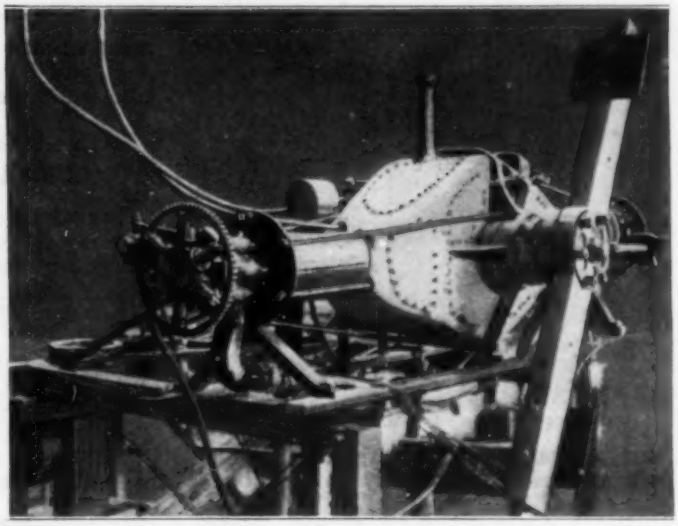
The mixing of sand, soil, and humus to obtain a preparation to promote the growth of grass on golf-course greens, may now be accomplished with a gasoline-engine outfit. A small one-cylinder motor and a screen equipped with an endless conveyor, to the shaft of which the motor is belted, constitute the equipment. The ingredients are shoveled into the conveyor, which carries them along the screen, the fine particles falling through, while the lumps are dumped at the upper end. The country-club officials who developed this outfit, declare that it has saved them a large sum annually.

IMPROVED ENAMELS FOR IRON WARE DEVELOPED

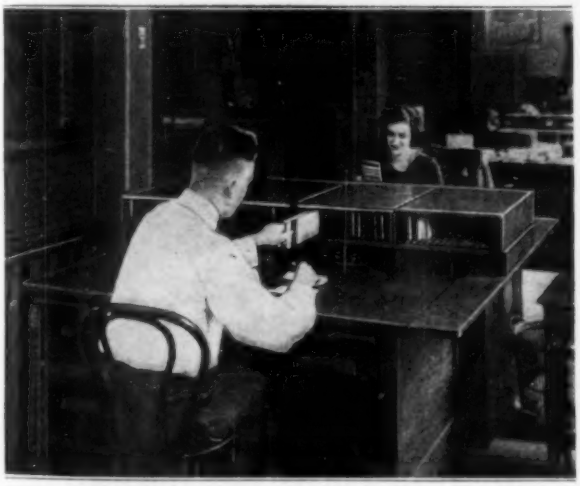
The cracking of enameled ware has been found to be due to the fact that the enamel does not "fit" the iron over which it is placed, according to recent investigations at the Bureau of Standards. All substances expand when heated, and contract when cooled, and so if the rate of expansion were the same for the iron as for the enamel, they would stay together throughout any amount of heating and cooling, instead of the enamel cracking as it does when cold water is poured into a heated utensil. As a result of the investigations, the bureau has evolved formulas for enamels that will fit the iron better.

SELF-COOLING AERO ENGINES WITH COMPLETE EXPANSION

A new French airplane engine that is attracting much attention, has a novel and very simple means of completing the expansion of the charge, after combustion, to little more than atmospheric pressure. This is done by making the stroke very long in proportion to the bore, and by having in each cylinder head only one small automatic inlet valve, with a comparatively strong spring, so that during the suction stroke the charge is drawn in through such a restricted opening that in volume, at normal pressure, it would be equivalent to only about half a cylinderful. The volume of the combustion chamber is so reduced by the long stroke of the piston that the compression of the charge, in spite of its reduced initial pressure, is as high as in any other engine, with proportionately high combustion pressures. Around the single small inlet valve in the cylinder head are a number of mechanically operated exhaust valves which eliminate all back pressure and maintain the low temperature of the fully expanded gases. The result is that the engine can be cooled without water jacketing, or even radiating fins. Besides the elimination of back pressure and the great reduction of temperature, there are two other notable results from this construction: The exhaust is practically noiseless, and there is the added work done by the completion of the expansion. The model in which the principle was tested out, has two horizontal, opposed cylinders, and is so light that, though developing 25 horsepower, it weighs only about 50 pounds.



Novel French Airplane Engine, under Test, Which, after Combustion, Completes the Expansion of the Charge to Little More than Atmospheric Pressure: It Is Self-Cooled and Weighs About Two Pounds per Horsepower



Efficient Filing Cabinet Which Aids Office Work, Showing How It may be Placed between Two Desks, Thus Enabling Both Employes to Use the Cards Freely

FILING CABINET OPEN ON TWO SIDES

Efficient filing cabinets for use in connection with correspondence files and the like, in offices where several persons simultaneously use the same collection of cards, are now available. In use, the appliance is located midway between two desks, or tables. Being open at both sides, the file may be reached by the employe at either desk without having to rise from their seats. The cards are mounted on steel panels, each of which has a capacity of 100 names and addresses. Owing to the manner in which the cards are attached to the panels, it is impossible to spill or disarrange them while handling.

WATCH USED AS SCARFPIN IS SMALLER THAN DIME

Almost a half less in diameter than a dime is the face of a new watch designed to be worn as a scarfpin. The Arabic hour numerals are quite distinct so that it is not particularly difficult to make out the time. While the face leads one to believe that the movement is also exceedingly small, this is partly an illusion, for the works, concealed in the folds of the scarf, are really slightly larger. The small face and stem are neatly proportioned.

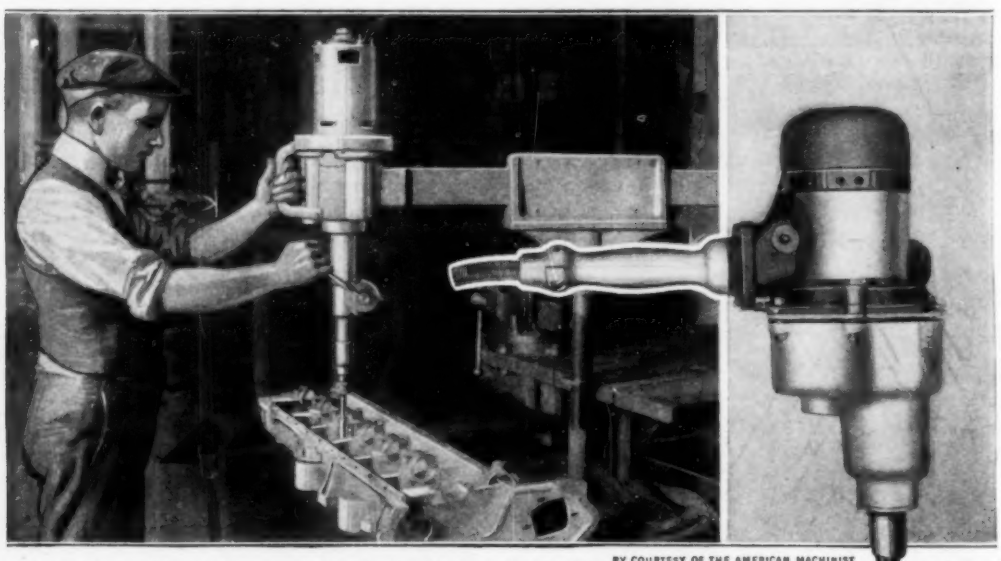
BY COURTESY OF THE JEWELERS' CIRCULAR

SCREW AND NUT-SETTING TOOL IS MOTOR-DRIVEN

A new tool for setting up screws and nuts is made in portable and stationary types and is driven by a self-contained electric motor. The portable type can be operated from an electric-light socket, and so can the stationary one if the line has the necessary capacity. The driving mechanism consists of a multiple-disk clutch, adjustable to different setting requirements, and a positive clutch which automatically "kicks out" when the disk clutch is released, permitting the removal and replacement of tools while the motor is running. The tools are furnished with recessed and tapered wrenches, in which nuts and screws can be picked up and held while the spindle is at full speed.

RADIATOR FAN WITH BLADES AUTOMATICALLY ADJUSTED

The cooling effect of an improved radiator fan is automatically controlled by a thermostat installed in the upper radiator-hose connection. When hot, this expands and adjusts the movable fan blades so that they draw the outside air through the front of the radiator. When cold, the thermostat contracts, reversing the adjustment of the blades so as to blow the hot air from the engine onto the radiator. At intermediate temperatures the fan blades are adjusted accordingly.



BY COURTESY OF THE AMERICAN MACHINIST

Left: Stationary Type of Screw and Nut-Setting Machine Which Handles Nuts and Screws from ¼ to 1 Inch in Diameter. Right: Portable Screw and Nut-Setting Tool, Which will Drive and Set Nuts and Screws from ⅛ to ½ Inch in Diameter

The Heavy Broken Line on This Map Indicates the $7,000,000 Highway to Connect San Francisco with the San Joaquin Valley Roads. The Unbroken Line Shows the Only Present Outlet Southward from San Francisco, and the Proposed Skyline Boulevard Appears in the Foreground

SEVEN-MILLION ROAD TO RELIEVE TRAFFIC JAM

By ROBERT MORGAN

TO afford relief from the congestion which accompanies the passage of thousands of automotive vehicles daily into and out of San Francisco on the southern side, San Francisco County, assisted by the county of San Mateo, is preparing to construct a paved highway, 100 feet wide, and approximately 35 miles long, at a cost, including the necessary bridge over the southern end of San Francisco Bay, of $7,000,000. The two counties have appropriated $225,000 for the purchase of rights of way and for detailed surveys of the proposed line of the road.

There is only one paved highway, and that a narrow one, leading southward from San Francisco along the peninsula of which that city forms the northern end. This highway, in order to get into San Francisco, passes through the range of hills that borders San Francisco on the south. Through these hills, and through the industrial section of lower or southern San Francisco, traffic had to move very slowly. As a consequence, while traffic on the highway south of these hills moved in continuous streams at 30 to 35 miles an hour, when it entered San Francisco it was automatically reduced to 15 miles an hour or less. This condition literally "piled up" traffic into San Francisco at the city's southern boundary, and the proposal of a new 100-foot highway is the result.

Estimates made by engineers place the cost of the highway as far as Redwood City, and thence eastward to the edge of the bay, at $4,300,000, and the cost of the bridge across the narrow bay, either at Ravenswood Point or at Dumbarton, at $2,300,000. The eastward turn from Redwood City, and the bridge across the bay, are almost as important as the relief from congestion at the entrance to San Francisco, since the eastward-bound highway will connect, at Niles, with the main paved highways to and from the great and productive San Joaquin Valley, thus putting this valley in direct connection with San Francisco, and giving its producers motor-truck and auto-stage transportation to that city and its markets.

As soon as the rights of way have been obtained and the survey completed, the interested parties will go before the state government and ask for state aid. The state, in turn, will ask for Federal aid, inasmuch as this is to be a part of the state-highway system.

Surveys and the work of obtaining the rights of way are now going on, and no time will be lost in pressing the work of construction. The highway will run, still 100 feet wide, directly to the heart of the San Francisco business district. It will be so divided by pavement markers that six lines of traffic, three each way, may pass simultaneously upon it, and San Francisco commercial and industrial

areas will be greatly increased by its construction, while north-and-south traffic will be released from the present narrow road to a space four times as great. Traffic over this road today is six times as great as it was in 1914, when the road was barely adequate for the traffic, so that from this some idea may be gained of the necessity which has impelled San Francisco to construct one of the widest paved highways in the world out of her back door into the heart of California.

DAILY INSURANCE POLICIES SOLD BY SLOT MACHINE

Daily insurance policies may now be taken out by prospective and apprehensive travelers who need only to insert a five-cent piece in a slot machine which also contains a scale for weighing. For death by train wreck, the nearest kin or other beneficiary receives $1,000; for death on a train from sickness, the payment is $500. Disability caused by any injury received while traveling on trains, yields $5 per week for a term of 26 weeks, according to the provisions of these policies.

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DATE AND STAMPING MACHINE HAS SIGNATURE OF USER

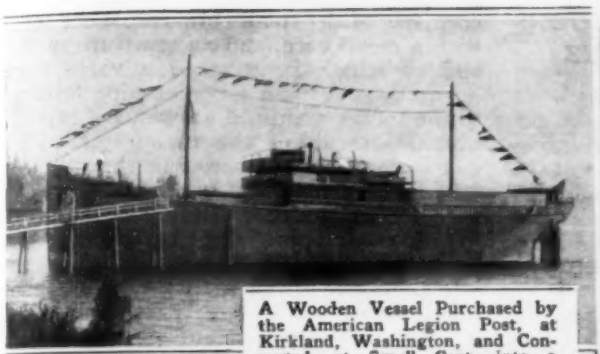
The responsibility for mistakes made in the dating or stamping of bills, receipts, or other documents of any kind, may be definitely placed with a machine in which is incorporated the signature of the person using it. In a large office employing hundreds of clerks, this would be a particularly welcome appliance. When thousands of papers are handled daily, errors invariably occur, and with the names of the persons responsible for them appearing on the documents, these mistakes may be quickly traced to their respective sources.

PAINTING LINES ON CHINAWARE EASIER WITH NEW DEVICE

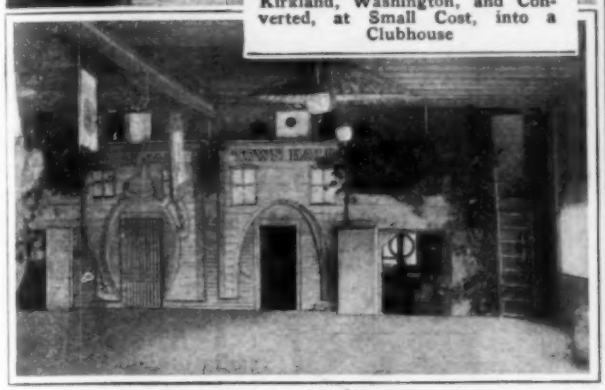
Lining chinaware is made easy by means of a new metal device. The arrangement consists of a small slide, the two hooked arms of which clasp the edge of the plate or bowl, and a movable crossbar with a screw adjustment. The crossbar is fixed at the desired distance from the edge, the pencil inserted, and the entire device drawn around the plate, leaving as it goes a clear, steady line.

NEW FIRE-ALARM BOX IS SIMPLE TO OPERATE

An improvement in fire-alarm boxes for the use of the public does away with the necessity of opening the outside door before pulling the alarm. With the new box only two operations are required: A pull of the handle opens the door and a pull of the hook turns in the alarm. A substitute for glass in the key guard eliminates the danger of cutting the hands, and pressed-steel cases, heavily enameled with porcelain, afford protection against high-voltage electricity and lightning.



A Wooden Vessel Purchased by the American Legion Post, at Kirkland, Washington, and Converted, at Small Cost, into a Clubhouse



Left: A Corner of the Spacious Dance Hall Which was Formed by Inclosing the Cargo Deck of the Converted Ship. Right: The "Town Jail" or "Jug," Which Is an Accessory Built for Initiation Purposes and Other Uses on Special Occasions

REBUILT SHIP IS AMERICAN LEGION CLUBHOUSE

The Warren O. Grimm Post No. 83, American Legion, of Kirkland, Wash., has provided itself, at comparatively small cost, with an unusual clubhouse. Several months ago the legionnaires purchased for $3,500 a 3,500-ton wooden steamer hull from the Emergency Fleet Corporation, and recently completed remodeling it into a clubhouse, at an expense of approximately $2,000 for materials.

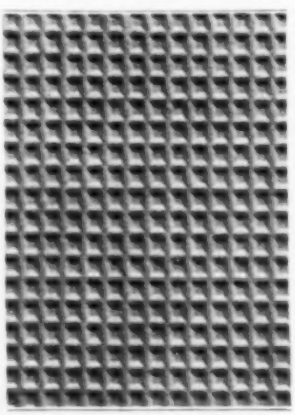
The hull was moored with its keel resting in shallow water on the east side of Lake Washington, and an inclined walk was built to it from the shore, with an admittance gate about halfway.

The cargo deck of the big steamer was resurfaced and inclosed, making a spacious ballroom. The whole ship was wired for electricity, and the cabin decks were converted into clubrooms; committee, men's smoking, and ladies' rooms, dining, and other rooms.

Opening night was marked by a huge celebration participated in by the various American Legion posts in the Puget Sound district.

NEW MOVIE SCREEN REDUCES GLARE AND EYESTRAIN

An improved movie screen is said to practically eliminate eyestrain and render the projected picture as clearly visible from a position at one side of the house as from a seat directly in front of the screen. It is made of a fabric to which is given a pure-white surface embossed with a multitude of small squares, resembling the surface of a miniature waffle iron.



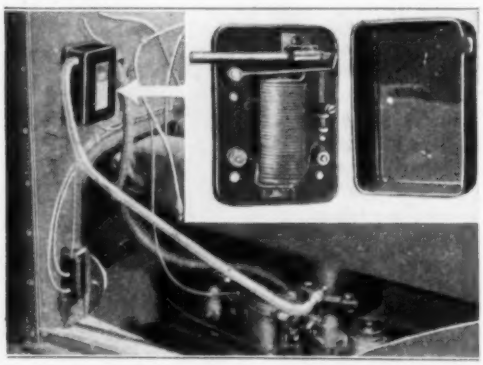
The perfect diffusion and uniform illumination claimed for the light reflected from this curtain, depend upon the accuracy of the design and construction of the checkered surfaces.

OILER FOR HARDWOOD FLOORS SPRAYS BY AIR PRESSURE

An oiler for hardwood floors has been developed for use any place where it is desirable to lay the dust and preserve the wood. The appliance is operated by air pressure. It has a cylindrical tank in which an air pump is incorporated, and a spring-tension attachment that controls a tiny sprayer. In use, a gallon of oil is placed in the outfit, a few pounds pressure pumped into the tank, after which the operator is enabled to spray any floor rapidly and in an efficient manner without waste of oil.

AIR FEED FOR FUEL MIXTURE REGULATED ELECTRICALLY

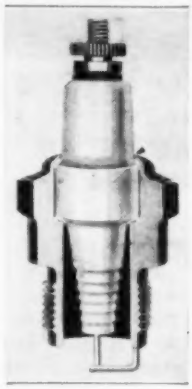
For regulating the supply of air mixed with the fuel in an automobile engine, and thus giving the greatest possible efficiency for varying speeds, an automatic electrical device is now on the market. It consists of a small low-resistance coil with a metal core, and an armature to the end of which is attached a valve that opens or closes an air-inlet pipe leading to the intake manifold, to which it is connected just above the carburetor. The coil is connected in series in the positive wire leading from the generator. At low speed, when a richer mixture is required, the magnetic force is not sufficient to attract the armature, and it closes the air inlet. As the speed increases, the armature opens the valve proportionately, until at high speed, when the armature is in contact with the coil, the valve is wide open, and the consequent air supply furnishes an economic fuel mixture. By means of a spring attached to the armature, it can be adjusted to suit any speed conditions.



Air-Feed Regulator Shown Installed on the Dash of an Automobile: Enlarged Inset View Shows It Opened Up, Exposing Its Low-Resistance Coil

CARBON-PROOF SPARK PLUG WITH RADIATING FINS

A new carbon-proof porcelain spark plug has been specially designed for winter driving by utilization of the principle of radiation. Around the inner end of the porcelain insulator are molded a series of saw-tooth girdles, so sharp-edged that they instantly attain a temperature high enough to burn off the oily soot that coats the smooth surface of ordinary porcelain insulators, and that may cause a short circuit. The plugs are made to suit all types of engines, and can be easily taken apart for cleaning.



PROVIDE NEW RADIO SERVICE TO LONDON AND GERMANY

Radio service from America to London and Germany is now available at a rate that will make it attractive to those who want to send messages to those places, according to a recent announcement. The rate is six cents a word, including the address and signature, with no minimum requirement. While a registered code address is acceptable, the text of the message is restricted to plain language. For the present the service is confined to London and Germany.

A View of the Lower End of the Bagley One-Man Shipyard, Looking toward the Water: The Marine Railway, on Which Vessels are Hauled High and Dry on the Land, and Its Largest Cradle Appear in the Center of the Picture, Which was Taken from the Roof of the Main Building

A ONE-MAN SHIPYARD

By L. R. PERRY

HERE is a tale of small things accomplishing big ones; of dimes performing the feats of dollars; of ambition developing inventive genius. It is an interesting testimonial to the fact that ambition backed by industry can make dreams come true.

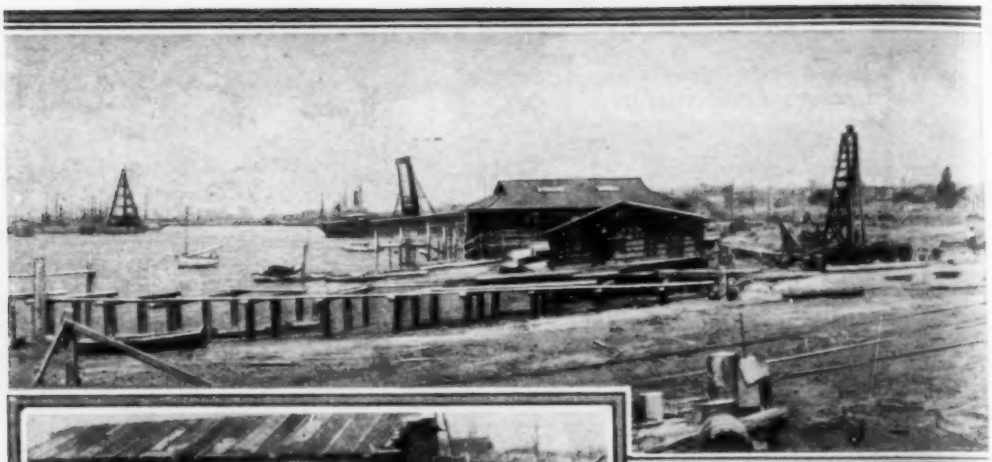
The whole thing "in a nutshell" might be called a one-man shipyard, for that virtually is what it is, a shipyard and marine railway that one man can operate from beginning to end. It is a little industry that handles big jobs; an enterprise founded on empty pockets that now has an annual turnover which is providing amply for several families.

An Old Tank Taken from a Dismantled Launch, Which has been Fitted with a Glass Level-Indicating Tube and is Now Used as the Gasoline Reservoir for the Engines

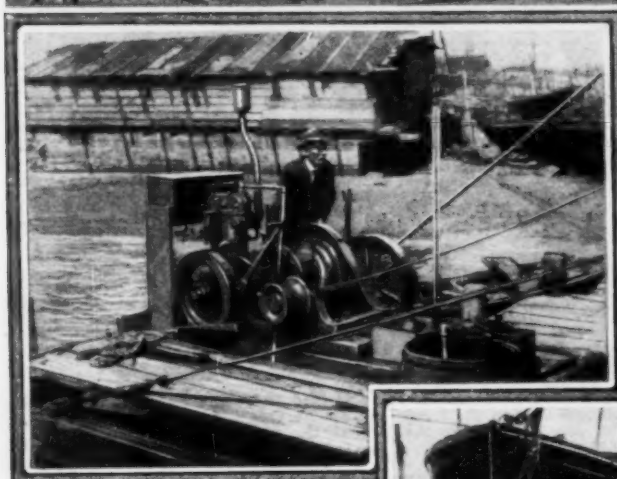
As the stranger comes upon this unique plant on the shore of Oakland estuary, California, the first impression is one of apparent dilapidation and disintegration. Buildings seem half torn down; things seem strangely scattered about. But the more a discerning eye investigates, the more the quite opposite is apparent—that the yard is alive and quite a novel one.

When, in my rambles with the camera, I happened onto this queer plant without its protecting fence, which no night watchman guards, I immediately sensed a story, and was not disappointed.

There are three personalities who mainly figure in this unique enterprise: J. W. Bagley, the father, and Percy and



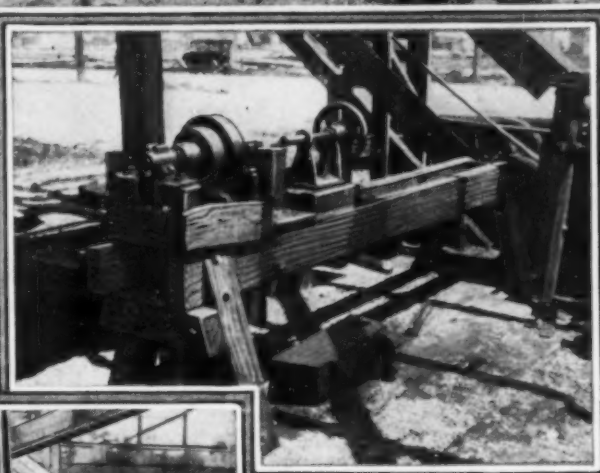
Above: A Partial View of the Bagley One-Man Shipyard from the Water's Edge, Showing the Pier, the Small Floating Pile Driver, and Several of the Portable Buildings of the Plant. In the Foreground a Portion of the Tracks of the Marine Railway can be Seen. The Shipyard Represents the Industry of a Father and Two Sons

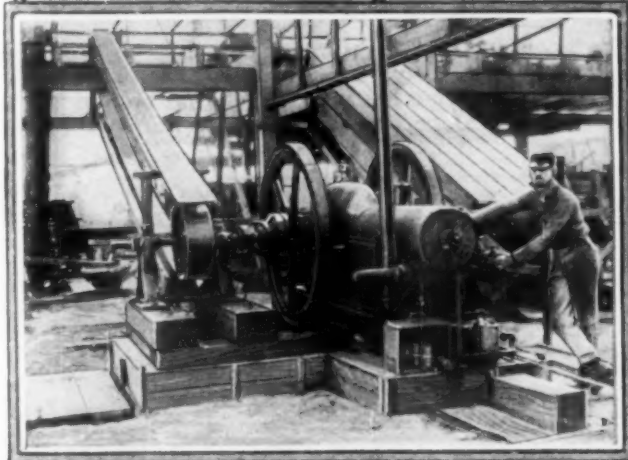


Above, J. W. Bagley, Father of the Ingenious Sons, is Operating the Hoist of the Small Floating Pile Driver, Which was Constructed from an Old Pontoon and Equipment Accumulated from Various Sources. It is Used for Contract Work as Well as around the Yard

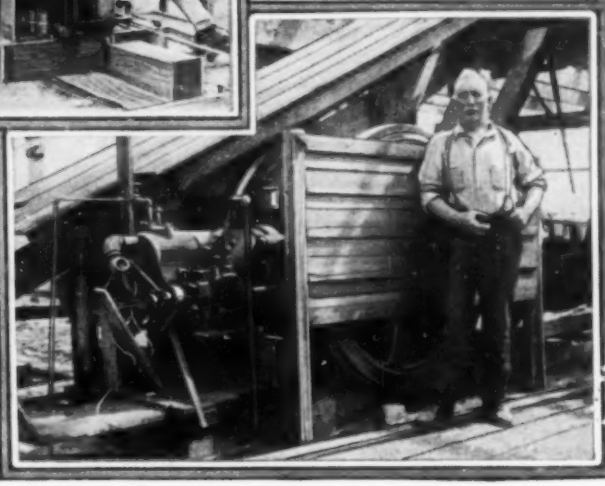
Above: The Bilge Blocks of the Cradles of the Marine Railway are Easily Slid into Position and Automatically Lock in Place under Water. Clamps Hold Them to the Cross Rails of the Cradle and They are Quickly Unlatched by a Jerk on a Cord. Left: Large Iron Sheave Made from Elevator Scraps and Used on the Head of One of the Smaller Cradles. It Is Only One of the Many Evidences of Resourcefulness

Above: A Continuation of the Bagley One-Man Shipyard from the Same Viewpoint, Showing Two Vessels Hauled High and Dry on the Marine Railway. Right: A Wood-Turning Lathe, Which Holds Anything from Dowels Up to Flagpoles and Rudder Posts, is Assembled on a Wooden Form, from Odd Parts of Machinery Picked Up Here and There





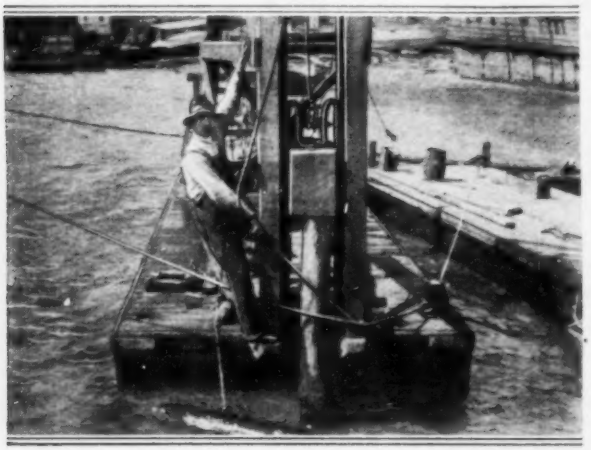
Left: Nelson Bagley and a View of the Engine Room, Showing a 25-Horsepower Gas Engine, Which Is One of Two Engines, Either of Which Is Capable of Running the Machinery in the Plant, Alone or in Combination with the Other



Right: A Safety Device in the Form of a Hinged Door That Serves as a Guard in Front of the Engine Flywheel. In Most Places in This Plant, Belting is Protected with a Housing of Boards, but in Some Instances It is Allowed to Run Exposed to All Sorts of Weather. The View Shows a 17-Horsepower Gas Engine Which can be Used Alone to Run the Plant, or Run in Combination with the Other Engine

Nelson Bagley, the two sons. The business is today largely conducted by the father, architect by profession.

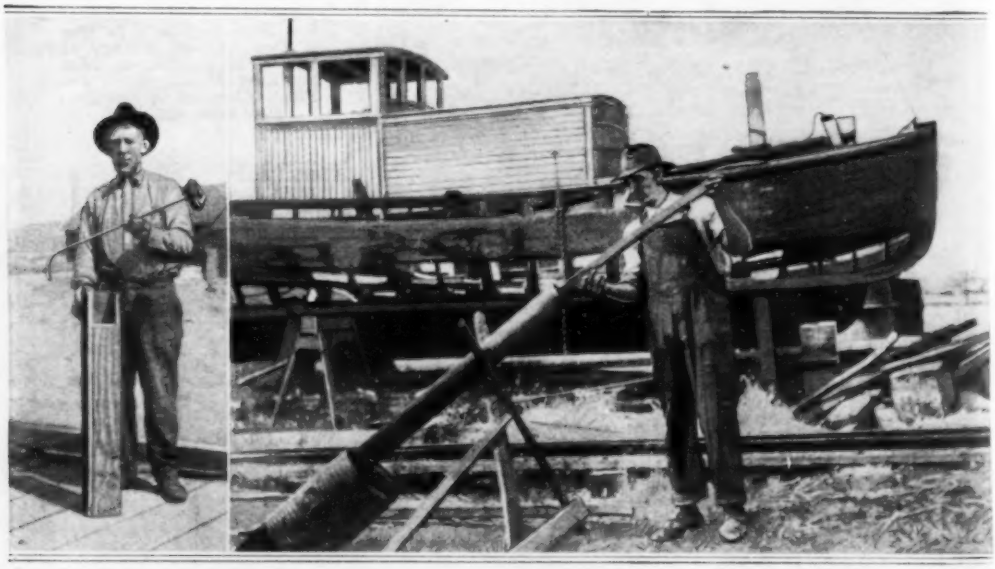
It is a striking feature of the conduct and expansion of this enterprise, to find its main building under steady use without roof and walls, and even parts of floors still missing. Yet, if the plant must "pay for itself as it goes along," why not put any surplus resources to other use? And, if various jobs call for extensive shifting of equipment, and bigger schemes are held in view, why not assemble collections of machinery on skids, house and all; and in such manner as to readily become part of future units or combinations? All the smaller buildings of the plant are on skids, and have been moved several times so as best to facilitate jobs in hand.



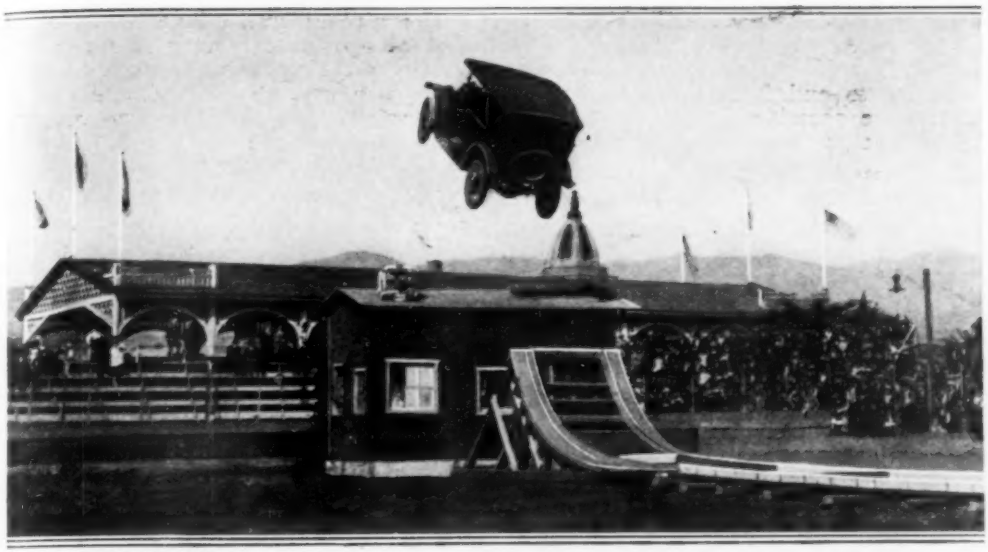
The Small Floating Pile Driver Operated by Percy Bagley: The Hammer Was Once the Counterweight of an Elevator. This 700-Pound Weight Now Easily Sinks a 10-Inch Pile

The big marine railway and cradle is an interesting mechanical contrivance in itself. Essentially it is quite different from the average marine railway in that its 90-foot cradle is underslung. The big wooden beams constituting the sides rest on axles. Fastened to the beams underneath with large U-bolts, and spaced about two feet apart, are the crossties of inverted 70-pound railroad rails. Keeled vessels rest on these and the steadying bilge blocks on the side beams, but flat-bottomed barges rest on the side beams, while the cradle is in transit. When ashore, the biggest barges are blocked up on the ground. This underslung type of marine railway takes up less room, draws less water, and permits a simple record of forms of hulls to be kept in repeated dockings.

It is surprising what large jobs this small yard can handle. The photos show numerous men at work; but one man can alone haul out large craft, work it, and return it.



Left: Simple Emergency Pump Made of Four Strips of Wood, Four Inches Wide, Nailed Together to Form a Long Box. A Square Piece of Flexible Leather Bolted to the Handle Acts as a Check Valve. Right: A Four-Inch Iron Pipe Serving as an Improvised Steam Box, Used in Bending Ribs for a Quick Repair Job on the Launch in the Background



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Small Touring Car Shown in the Act of Leaping over the 15-Foot House: In the Foreground is Seen Part of the Long Track Having the Sharp Incline at the End. The Grand Stand, in the Background, is Well Filled with Interested Spectators

SMALL TOURING CAR LEAPS OVER 15-FOOT HOUSE

Leaping over a house 15 feet in height, was the performance of a small touring car, recently, when this feat was exhibited as an amusement-park "thriller." A track, having a sharp incline at the end, was laid so that it led up to the house. Then the car was started along the track under its own power. Gathering great momentum by the time the abrupt upward turn at the end was reached, the machine leaped high in the air, easily clearing the structure.

SHIP DRIVEN AGAINST WIND BY WIND-DRIVEN TURBINE

A ship that can be propelled dead against the wind by means of an exclusively wind-driven turbine, thus making the wind an aid instead of an obstacle, has been developed by three engineers in France, and was described recently before the Academy of Sciences. The turbine has been tested on a light boat, equipped with a screw propeller. The turbine is driven by the velocity of the wind, and there is such a perfect system of power transmission to the propeller that it drives the boat into the eye of the wind from which the turbine derives its motive power.

¶ Recently an English explorer of Tibet was surprised to find that the Dalai Lama owns and operates a motorcycle.

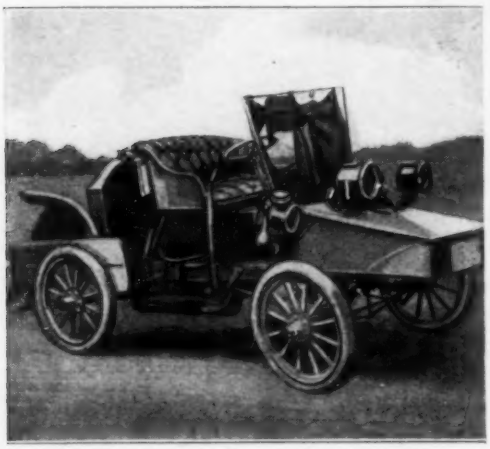
PAD IN TOBACCO POUCH MOISTENS CONTENTS

A rubber-lined tobacco pouch which contains a moistening pad, for keeping the contents in good condition, is the latest innovation for pipe smokers. The pouch is of convenient pocket size and has two snap fasteners that hold the top tightly closed after the tobacco has been placed within. To fill a pipe, it is not necessary to open the pouch, as a small outlet is incorporated in it, through which the tobacco may be poured.

Above: Tobacco Pouch in Which is Incorporated an Oval Moistening Pad to Keep the Contents in Good Condition. Right: Pouch Closed, Showing the Side "Spout" through Which the Tobacco is Poured

PORTABLE SAWMILL BUILT ON OLD MOTOR CAR

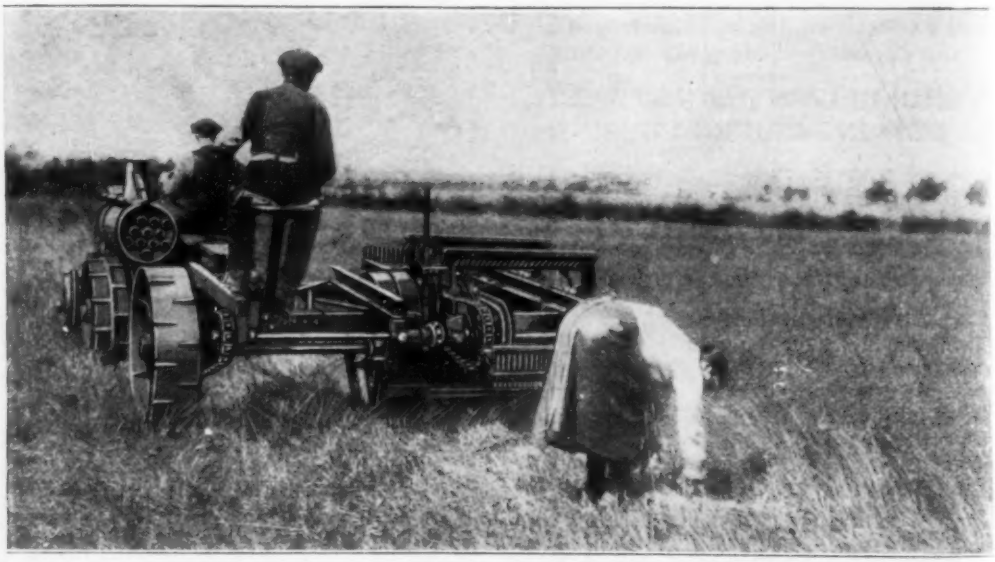
Riding to and from the scene of his labor on a portable sawmill, with which he daily cuts 10 cords of wood, is the occupation of a Massachusetts man. His homemade "mill" consists of a small motor car, 1906 model, on which a circular saw has been ingeniously rigged. With this odd outfit, the man tours over considerable territory, contracting to saw wood. Although the mill, or machine, is not impressive in appearance, the owner finds it a remunerative investment, for the cost of operation is very small, and he usually picks up enough work to make every trip pay. The engine was originally air-cooled, but the owner rigged it up for water cooling.



Portable Sawmill Built on an Old Motor Car, Showing the Circular-Saw Attachment at the Rear of the Strange-Appearing Outfit

MACHINES FOR FLAX-PULLING TO SUPERSEDE HAND LABOR

One of the most costly and tedious of the processes in connection with the manufacture of linen is the pulling of the flax, which hitherto has had to be done by hand. New attempts are now being made in Europe to do this mechanically, and several tests have recently been made of different flax-pulling machines. The most successful seems to be one that is now running in Ireland. This machine, like others tried in England, France, Russia, and Canada, fundamentally consists of a comblike arrangement that grasps the flax stems, and by the resistance of the seed capsules of the fiber plucks them from the ground. All weeds growing among the flax slide through the puller and are not plucked. After being pulled, the flax is thrown onto a binding arrangement similar to that used in grain harvesters. It is then bound and shocked, also like sheaves of grain. The flax puller is hauled by horse or tractor, and only a driver and an operator on the puller are needed to operate the machine, which will harvest about 10 acres a day.



Flax-Pulling Machine That Harvests Flax Much in the Same Manner as a Binder Harvests Grain, Excepting That It Pulls the Flax Stems Out by the Roots Instead of Cutting Them: This is Done by the Comblike Device Driven by the Endless Chain

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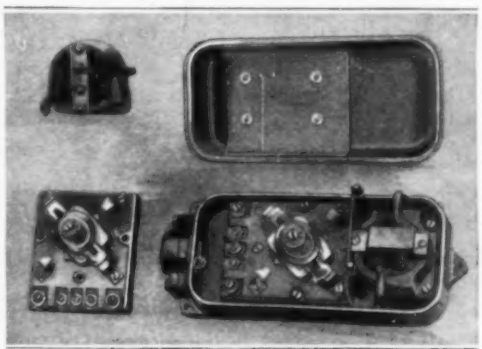
Apparatus Used in Determining the Digestibility of Foods at the Bureau of Chemistry, Department of Agriculture, Where Formerly the Action of Certain Foods on White Rats and Guinea Pigs was Studied for the Same Purpose

TEST DIGESTIBILITY OF FOOD IN GLASS CONTAINER

The digestibility of certain foods is now being determined in suitable laboratory apparatus in preference to the method of studying their action on white rats and guinea pigs, at the Bureau of Chemistry, Department of Agriculture. For example, beans are placed in a glass container with a dilute solution of hydrochloric acid, similar to that found in the human stomach, a quantity of pepsin is added, and the mixture is placed in an incubator having a temperature of about 98° F., or the same as exists in the stomach. At the end of a given time, the contents are analyzed, and then treated with chemicals approximating the juices found in the lower digestive tract.

MOTOR-OPERATED SNAP SWITCH HAS WIDE APPLICATION

A new motor-operated snap switch that can be used on direct or alternating current, with little power consumption, and is applicable wherever automatic control of electrical devices is desired, has recently been produced. The switch is ruggedly built and mounted on a porcelain block, secured to the bottom of the cast-iron switch box, and a specially designed motor is also fastened to the bottom of the box and geared to the switch, from which it is separated by an insulating barrier. The motor is connected to the auxiliary control circuit and only operates intermittently. The bearings are of a special self-lubricating material.

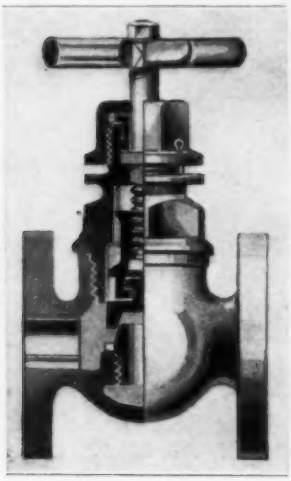


This Motor-Operated Snap Switch Is Adaptable Wherever Automatic Control of Electrical Devices is Desired, and Consumes Little Power

¶ The discovery of an alloy termed "oreum," said to have the brightness, durability, and inoxidability of gold, has recently been announced by a French chemist, who also claims that these qualities will permit its substitution for gold in jewelry and other similar manufactures.

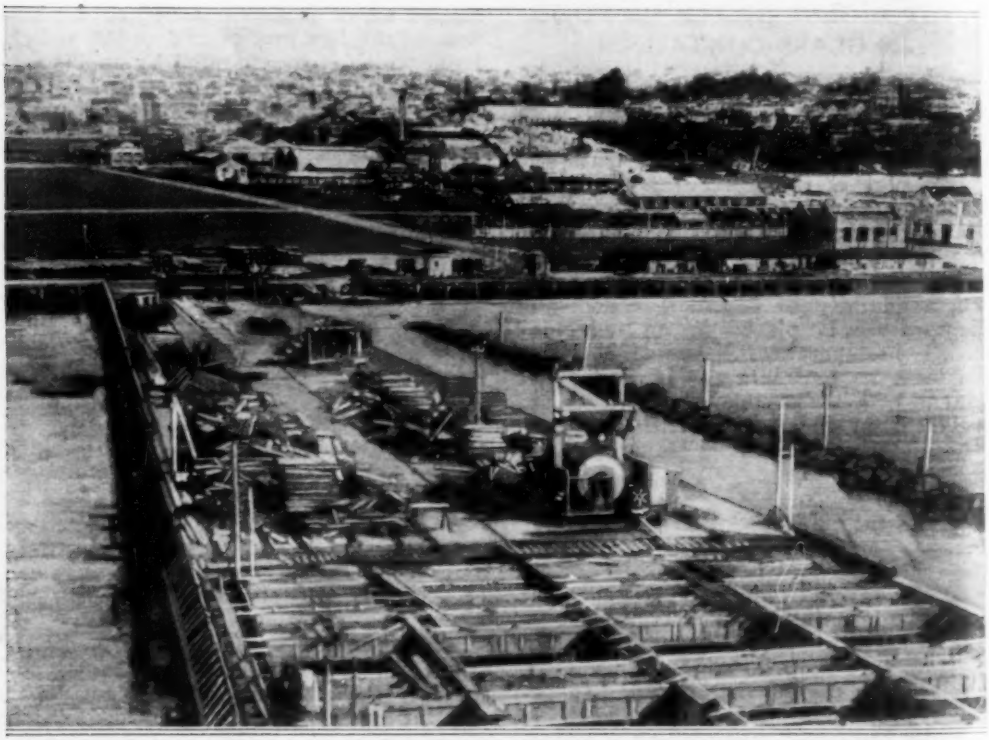
NO PACKING IN STEAM VALVE WITH RENEWABLE PARTS

Steam valves, especially those used on superheated systems, require considerable attention to the packing in order to prevent leakage. To overcome this nuisance, an English firm is manufacturing a packless valve which will operate satisfactorily on superheated as well as saturated-steam installations. In addition to being without packing, the four wearing parts, namely, the seat, clack valve, nut, and spindle, are all renewable and tend to lower the maintenance costs.

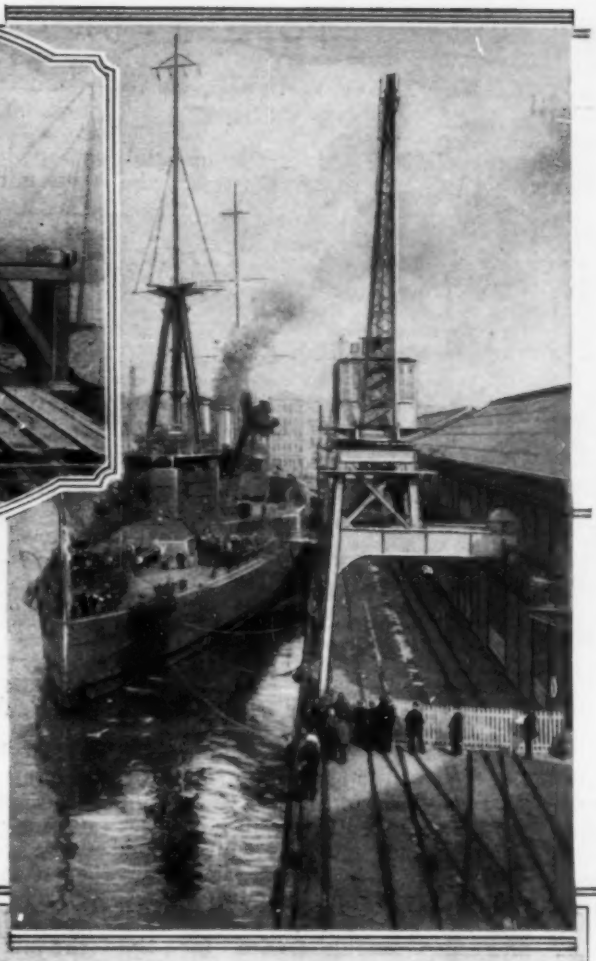


SEVERAL HARBOR EXTENSIONS AT AUCKLAND, NEW ZEALAND

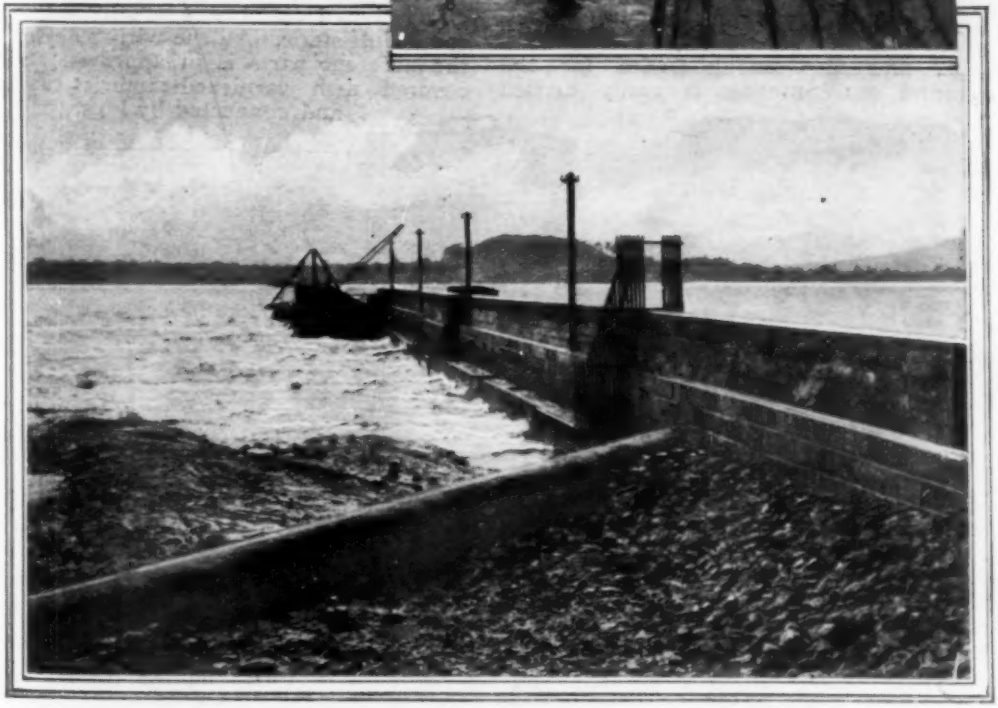
A comprehensive system of harbor improvement is in progress at Auckland, New Zealand. Included therein are reinforced-concrete wharves, 240 to 280 feet wide, with deep-water berths, and steel cargo sheds, 320 feet long and 60 to 80 feet wide, equipped with modern loading and conveying machinery. All the wharves have a roadway 60 feet wide along their centers, and will eventually be provided with railroad connections from each berth. Refrigeration plants and lumber mills will be erected close to the berths. There are already sixteen 3 and 5-ton electric cranes, besides electric capstans, and others will be provided as the work progresses. Also, a large self-propelling floating crane, capable of lifting up to 80 tons, is now in operation. A great deal of reclamation work has already been done, hundreds of thousands of cubic yards of filling having been deposited in the last two years. At one point the reclamation is banked with a solid stone wall, of which 740 feet are already in place. Gas and electric lamps provide illumination.



One of the New Reinforced-Concrete Wharves under Construction, That will Form Part of the Harbor Extensions at Auckland, New Zealand: These New Wharves Are 240 to 280 Feet Wide; along the Shore can be Seen Part of the Stone Wall Erected in Connection with the New Embankment

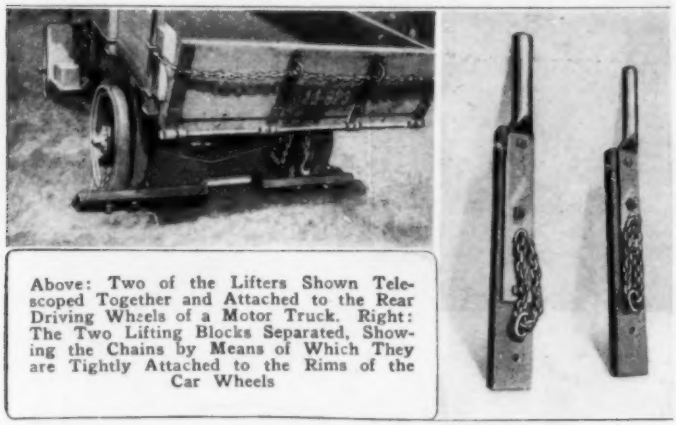


Above: Traveling Concrete Mixer at Work on One of the New Wharves in Connection with the Harbor Extensions at Auckland, New Zealand. It is Used for Making the Concrete Piles for the Wharf. Right: Part of One of the Reinforced-Concrete Wharves, Showing the Quay Side, with Its Railway Lines, and One of the Large Electric Traveling Cranes. Beside the Quay is Seen Part of One of the Two-Story Steel Cargo Sheds Which Are 320 Feet Long and 60 to 80 Feet Wide. Below: Concrete Pier Built to Act as a Tide Deflector in Connection with the New Harbor Extensions



ATTACHMENT TO WHEEL LIFTS MIRED MOTOR TRUCKS

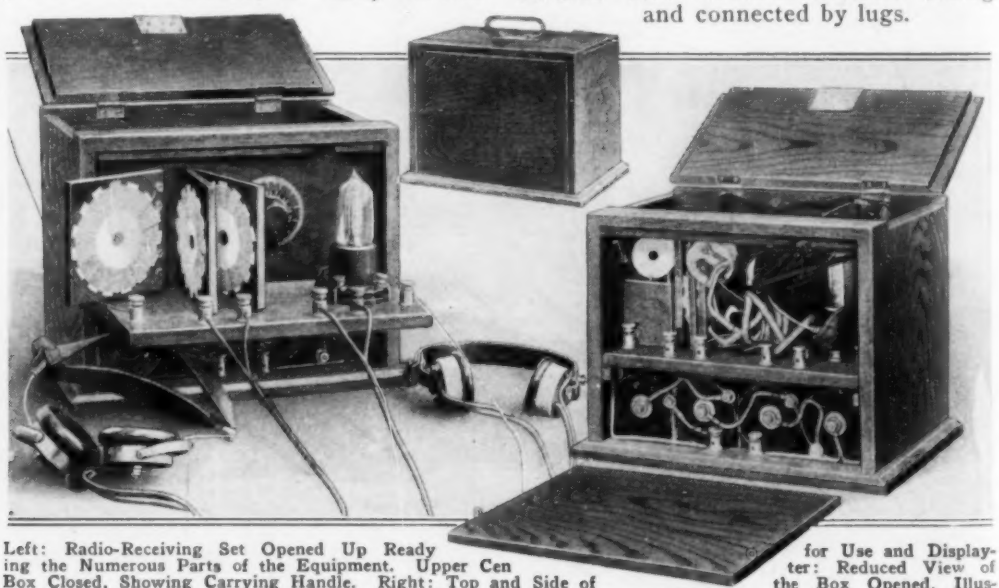
For lifting motor trucks out of mud, sand, or snow, in which they may be stranded, a portable attachment for connection to a mired wheel is in the form of a wooden four-sided block, in length about half the width of the truck. About the middle of this block is an eyebolt through which a chain having a hook at one end is passed. This chain is long enough to encircle the rim of the wheel, against which it is made tight by slipping the hook into a link of the chain. A tubular extension at the end of the block is so made that, when two blocks are placed on opposite wheels, they will telescope together. The truck is lifted by the blocks when the wheels are rotated.



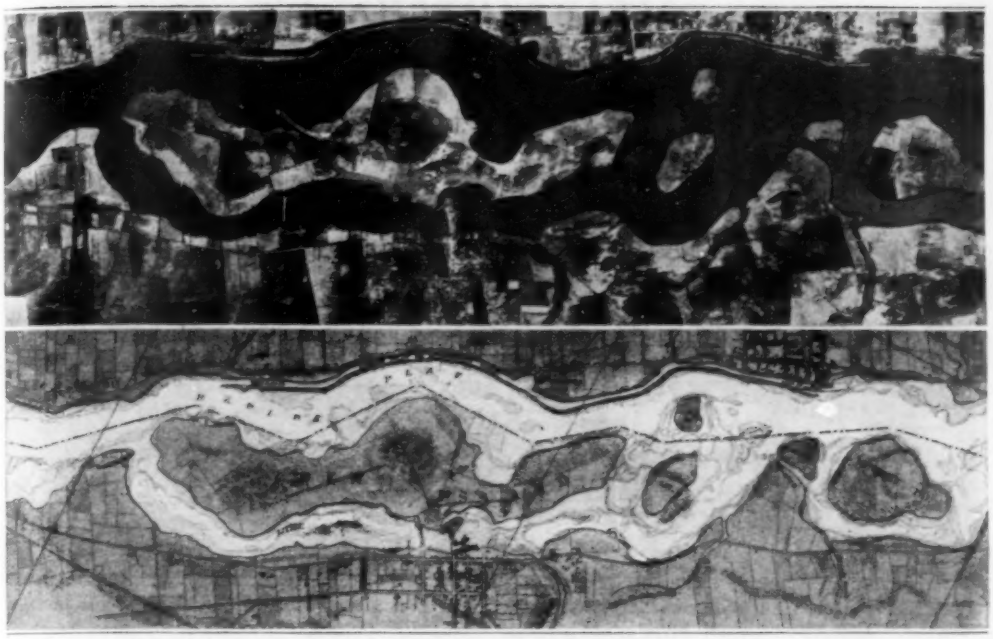
Above: Two of the Lifters Shown Telescoped Together and Attached to the Rear Driving Wheels of a Motor Truck. Right: The Two Lifting Blocks Separated, Showing the Chains by Means of Which They are Tightly Attached to the Rims of the Car Wheels

RADIO OUTFIT COMPACT AND PORTABLE

Nontechnical radio enthusiasts now have available to them a portable regenerative, or receiving, outfit which is not costly and is simple to control. The set is compactly constructed. Inclosed in a box, 7 by 9 by 11 inches in size, the equipment, consisting of A and B-batteries, head phones, vacuum tube, tuning coils, etc., and also enough wire for the ground and antenna, is easily carried from place to place. It has a normal receiving range of 500 miles. During recent tests in Galveston, Tex., concerts from Georgia, Tennessee, Kansas, and Missouri were regularly received, while stations even more distant than these were also clearly heard despite the usually troublesome Gulf static. All the wiring between the different parts is in approved style, covered with varnished-cambric tubing and connected by lugs.



Left: Radio-Receiving Set Opened Up Ready for Use and Displaying the Numerous Parts of the Equipment. Upper Center: Reduced View of Box Closed, Showing Carrying Handle. Right: Top and Side of the Box Opened, Illustrating the Compact Manner in Which the Outfit may be Packed for Carrying



Top: Mosaic Map Made Up of 150 Photographs Taken from an Airplane. Below: A Hydrographic Chart, or Standard Map, of the Same Area, Drawn to Approximately the Same Scale. Note the Accuracy of Detail in the Aerial Mosaic

AERIAL MOSAIC MAP SHOWS MARVELOUS DETAIL

By GEORGE F. PAUL

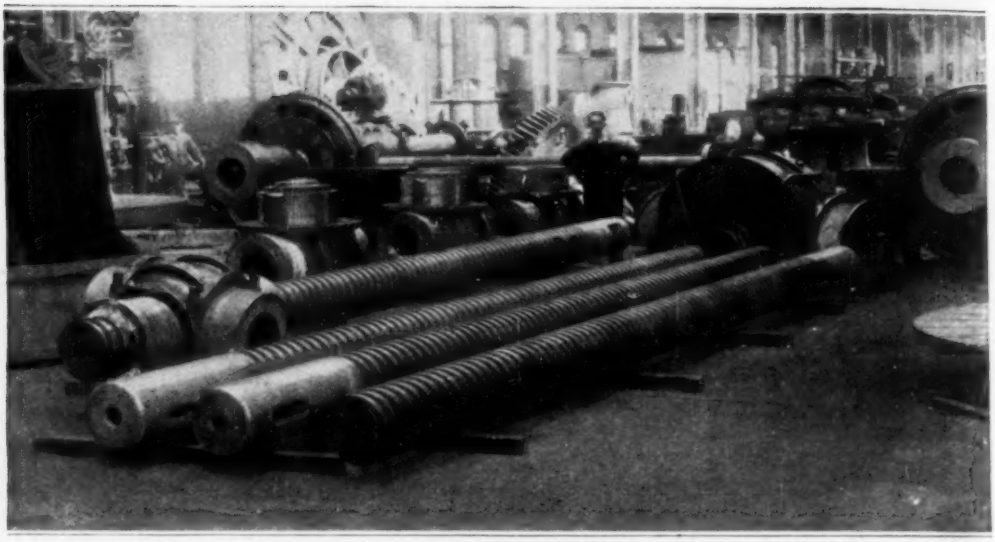
THE possibilities of aerial photography in mapping water routes have been strikingly demonstrated in mosaics prepared by the Canadian Air Board, showing stretches along the St. Lawrence River. These mosaics were made for the Canadian section of the International Joint Commission for use in connection with its report on the St. Lawrence waterway project. The marvelous detail of these mosaics is brought out by comparison with charts made by the Corps of Engineers of the United States Army and issued by the United States Lake Survey Office. Probably no more accurate mapping and finer reproduction could be chosen for comparison purposes.

The pictures were taken from a DH-4 aeroplane, at an altitude of 8,000 feet, flown from Ottawa Air Station by Lieut. H. L. Holland. The flying conditions were excellent, and so closely did the prints from the original negatives match, that no rectification of the individual negatives was found necessary. This shows that under good flying conditions and with careful and skilled piloting remarkably accurate results can be obtained.

Owing to constant changes in light and shade on the water surfaces, due to ripples caused by the varying winds, passing water craft, and other natural conditions, it was found impossible to obtain even matching in texture of the pictures forming the mosaic over such areas. To overcome the patchy appearance due to this, the water areas were brushed over so as to give a uniform texture. With this exception the mosaic was made direct from prints off the original negatives.

The possibilities of time and labor saving in map making can readily be seen from the comparison. Aerial surveying by photographic methods is being rapidly developed, and scientists in many countries are working on the development of maps, accurate to scale and elevation, from oblique and vertical aerial photographs. Mosaics such as here shown do not pretend to absolute accuracy, and cannot at present take the place of maps made from ground surveys. They are rather supplementary to them, giving an actual reproduction of the terrain as it exists, and showing it in much greater detail than the most carefully made map.

Provided a series of points, recognizable from the air, were fixed on the ground along a stretch of country of which a map was required, the whole of the detail of the map could be transferred from vertical aerial photographs taken, and the laborious process of traversing the whole could be dispensed with.



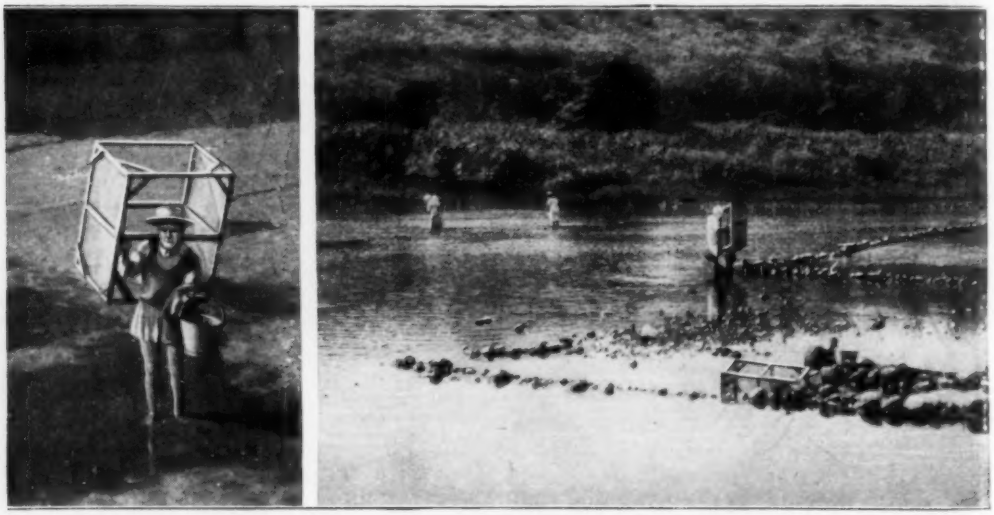
The Above are Reported to Be the Largest Luffing Screws Ever Made. Each Screw Is 15 Inches in Diameter, 28 Feet Long, and is Designed to Carry a Maximum Load of 1,000,000 Pounds; the Nut in Which It Turns, Weighs 5,000 Pounds

NAVY CRANE TO HAVE WORLD'S LARGEST LUFFING SCREWS

What are reported to be the largest luffing screws have been installed to move the boom of the 250-ton crane recently mounted on the old battleship "Kearsarge." Each screw is 15 inches in diameter, 28 feet long, and has a 2-inch square thread designed to run through a manganese-bronze nut, 5 feet long, that weighs 5,000 pounds. The screws are made of chrome-nickel steel, having an ultimate tensile strength of 120,000 pounds per square inch, and are designed for a maximum load of 1,000,000 pounds each.

STRANGE METHOD OF FISHING IN HAWAIIAN ISLANDS

Natives of the Hawaiian Islands are fond of a small mudfish which they catch in an interesting manner. The spawn of the fish is regularly carried downstream to the sea by freshets, and, after hatching,



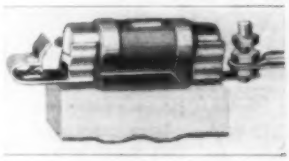
To the Left is Shown a Native Carrying the Type of Fish Trap Which Is in Common Use in the Hawaiian Islands. On the Right in the Foreground the Trap Is in Place at the Narrow Opening between Two Converging Dams. The Native in the Background is Emptying His Catch into a Small Pail

the "hinana," as it is named, begins swimming upstream. On the way it is led by converging dams, built with rocks gathered from the surrounding country, into boxlike traps, covered on all but the downstream side with fine wire gauze. By this means the fish are caught in large quantities.

DESERT SOIL TO BE TREATED WITH SULPHURIC ACID

A donation of 100 tons of sulphuric acid to be used for experimental treatment of alkali soils in Arizona, has been made by a western mining company. The application of the acid and the subsequent care of the test crops will be conducted under the supervision of chemists and soil experts, some of whom believe that not only will worthless land be reclaimed but crop betterment result on large areas now under cultivation.

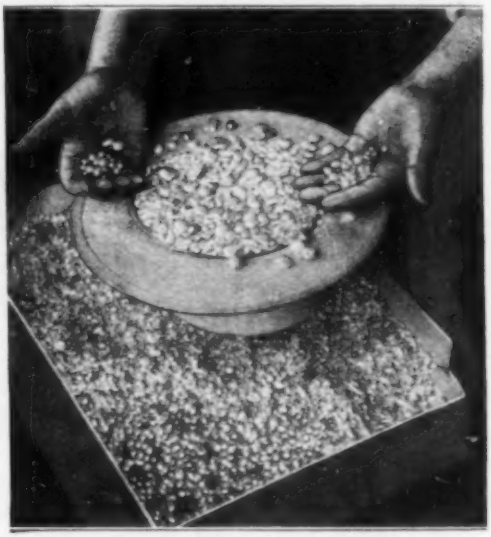
RADIO LIGHTNING ARRESTER HAS INCLOSED GAPS



Lightning arresters are now a necessity of radio equipment and have been made the subject of a special ruling by the National Board of Underwriters. Each installation must be provided with an arrester that will operate at a potential of 500 volts or less. An arrester in which the gaps are widely separated and protected by a glass container has been produced, and is obviously superior to the ordinary air-gap type. The latter is frequently clogged with flying particles of dirt or other foreign matter, which entirely destroys its protective value.

MANY AMERICAN PEARLS SOLD TO WOMEN OF INDIA

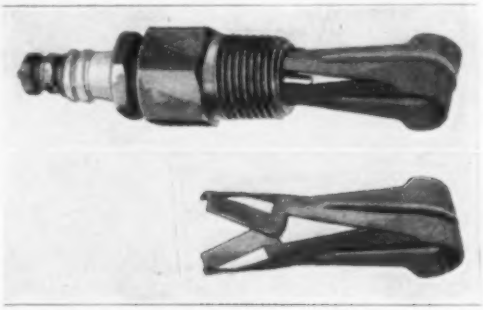
It may surprise many American people to know that pearls of beautiful luster, perfect in shape, some weighing many grains and worth several hundred dollars, are regularly gathered from the Mississippi River. Pearls known as baroques, chunks of rough surface and imperfect shape but of many colors, are among the less expensive types collected. Then there are small dull bits known in the hunters' parlance as "slugs." These are so plentiful in the river that buyers sometimes accumulate them by the peck. India, where the Hindu women covet the slug to use in embroidering gowns, making necklaces and other ornaments, is the principal market for this class of pearl.



Here are Shown Mississippi Pearls of All Kinds, Some Perfect Ones in the Hands beside Baroques, a Hatful of the Latter, and a Peck of "Slugs"

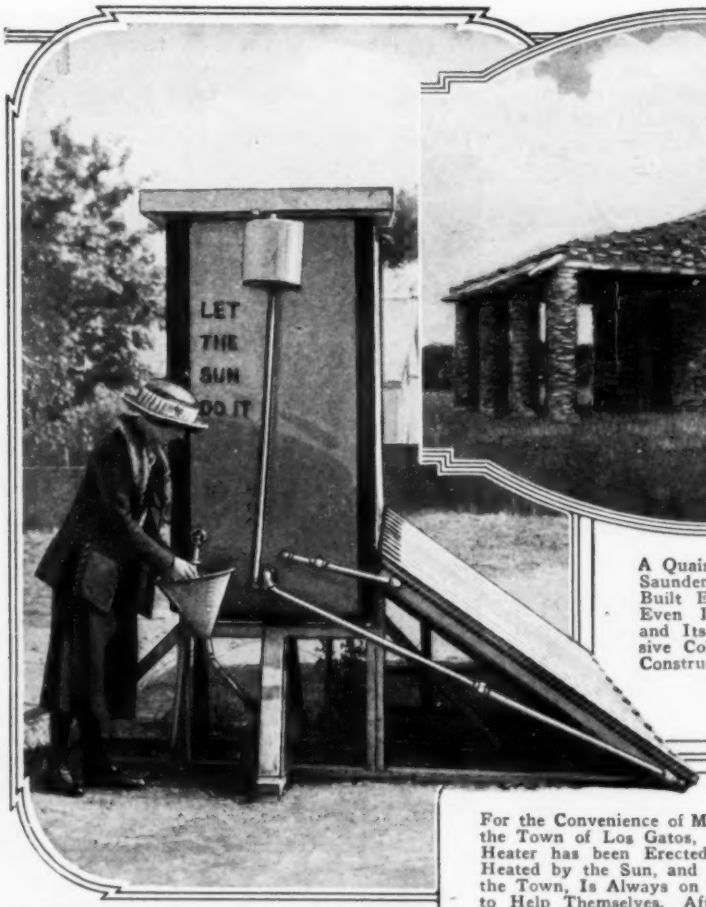
CLEANER FOR SPARK PLUGS ALSO USED AS GAUGE

Spark plugs may be easily and rapidly cleaned by the use of a simple and inexpensive appliance which is manufactured in several sizes and can be used for most kinds of open-end plugs. The article is made of tempered steel in one neatly finished piece. The thickness of the metal provides a gauge for adjusting the spark terminals, which may also be scraped with a tiny file that is incorporated in the contrivance.



Top: Cleaner Shown Inserted in an Open-End Spark Plug. Bottom: Cleaner, Illustrating Its Simple Construction

CIVIC FEATURES THAT PROMOTE THE COMFORT



A Quaint Old Blacksmith Shop near Saunderstown, Rhode Island: It is Built Entirely of Stone, Including Even Its Curiously Shaped Roof, and Its Porch with the Four Massive Columns. It Is of Such Solid Construction That Time Has Little or No Effect on It

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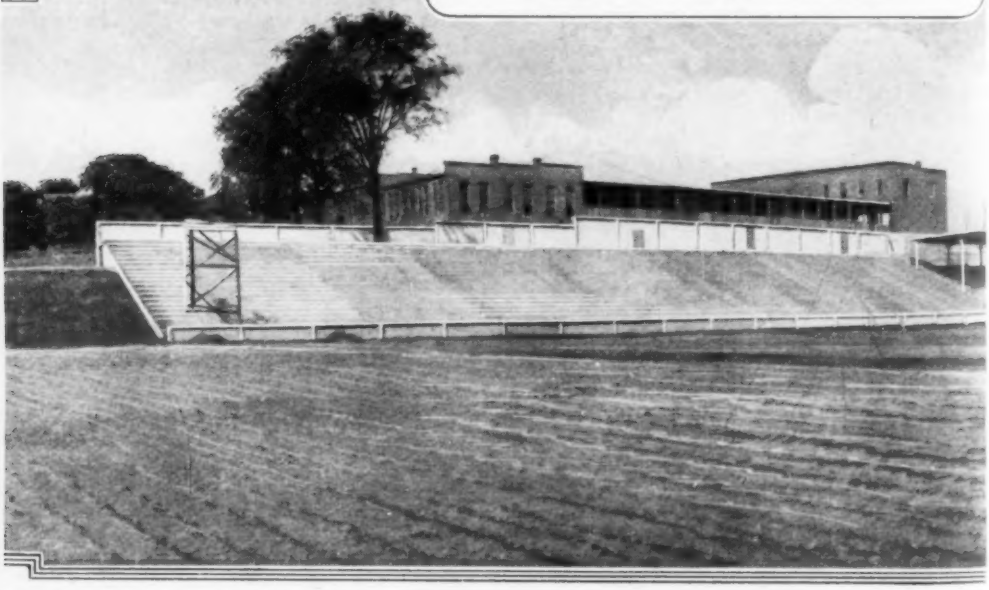
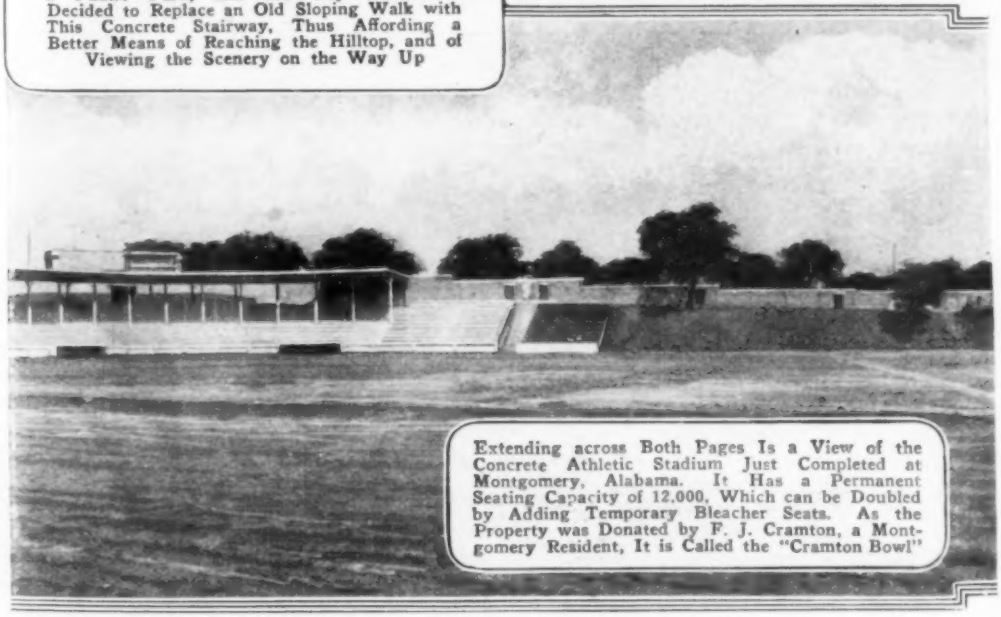
For the Convenience of Motor Tourists Passing through the Town of Los Gatos, California, This Solar Water Heater has been Erected on a Vacant Lot. Water Heated by the Sun, and Therefore at No Expense to the Town, Is Always on Tap, and Autoists Are Free to Help Themselves. After a Long, Dusty, All-Day Ride, This Convenience Is Very Welcome



AND ENJOYMENT OF VISITORS AND RESIDENTS

During the "Safety-Week" Campaign at Atlanta, Georgia, This Monument was Erected at the City's Most Dangerous Street Corner as a Reminder of the Necessity of Care. The Monument Is 12 Feet High, and is Made of Wood Painted to Resemble Marble

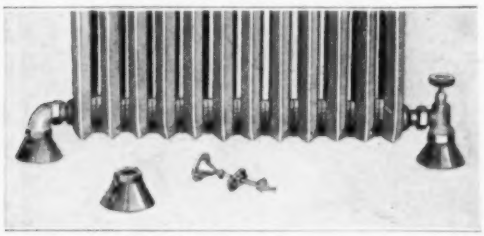
Picturesque Concrete Stairway That Climbs a Rocky Hillside on North Main Street in Dubuque, Iowa: At the Top of the Hill Is a Public Park, and the City Authorities Decided to Replace an Old Sloping Walk with This Concrete Stairway, Thus Affording a Better Means of Reaching the Hilltop, and of Viewing the Scenery on the Way Up



Extending across Both Pages Is a View of the Concrete Athletic Stadium Just Completed at Montgomery, Alabama. It Has a Permanent Seating Capacity of 12,000, Which can be Doubled by Adding Temporary Bleacher Seats. As the Property was Donated by F. J. Cramton, a Montgomery Resident, It is Called the "Cramton Bowl"

LEGLESS RADIATOR SUPPORTED BY NEW ATTACHMENT

By means of a new device the bothersome legs of radiators, from around which dirt is removed with difficulty, are



In Connection with the Floor Supports, a Wall Bracket Prevents the Legless Radiator from Tipping. One of the End Supports and the Center Rest are Shown in the Foreground

done away with and the radiator supported from the pipe connections at the floor. Inconspicuous wall braces prevent the radiator from tipping, and adjustable center rests are provided for long radiators. The attachments are made to suit the sizes of pipe commonly used for radiator connections, and they are adaptable to any size or make of radiator.

WORLD'S FAIR ADVERTISED BY RADIO CARAVAN

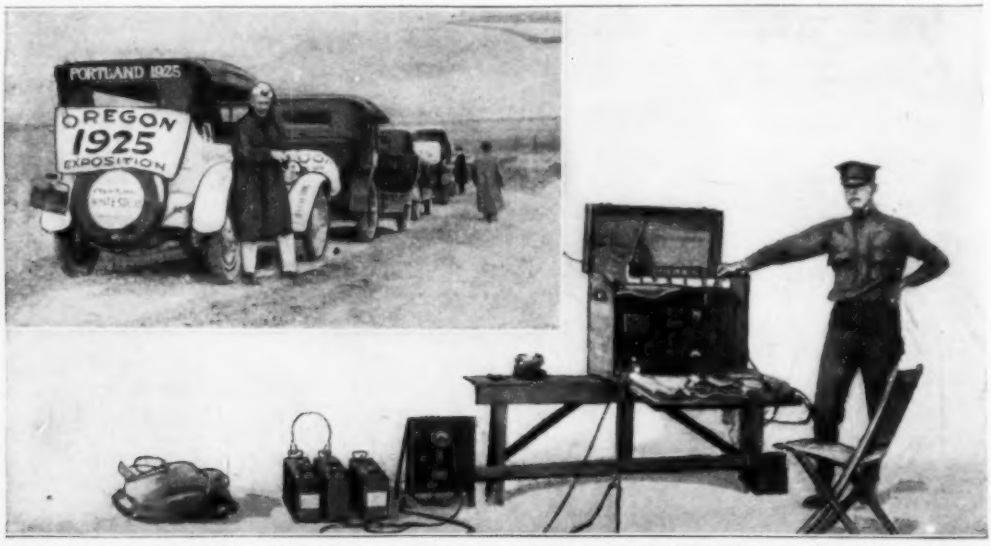
Advertising a world's fair by radio, was the method employed by Oregonians during a recent campaign to interest the people of that state in the Atlantic-Pacific Highways and Electrical Exposition to be held at Portland, in 1925. A tour of eastern Oregon was made by 85 persons in 25 automobiles. Three army radio operators accompanied the caravan and demonstrated their apparatus. Thousands of country folk and ranchers, many of whom had never seen radio equipment nor listened to broadcasting, thronged about the cars containing the wireless outfits.

TENNIS BALLS ARE CARRIED ON RACKET BY SPRING

Tennis players will appreciate an appliance introduced for the purpose of carrying that extra set of balls to and from the courts during the summer months when pocket space is usually limited. The contrivance consists of a spiral spring of brass wire, wound in such a manner that

Spiral Spring for Carrying Tennis Balls, Showing the Two Ball-Holding Loops Held on the Racket by the Connecting Spring

it may be fastened to the side of a racket by its own tension, and containing two ball holding loops. During the game, the spring may be hung on the net.



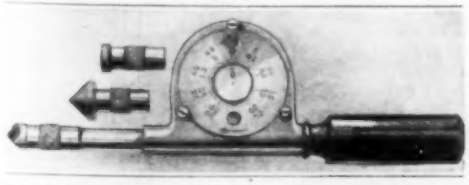
One of the Regulation United States Army Radio Sets Used during the Trip of the Caravan That Toured Eastern Oregon to Advertise a Coming Exposition: Insert Shows Poster-Decorated Cars of the Outfit

SMALL WOODS ON MOUNTAINS CONSERVE THE MOISTURE

In central Tennessee, where drought more or less prevails, a simple method of conserving the moisture has been adopted. Throughout the district are many cone-shaped wooded mountains, and when these are cleared for cultivation a clump of trees is always left at the top, usually covering from 5 to 20 acres. It has been found that the moisture-conserving and distributing effect of these standing trees increases the crops of wheat on the cultivated hillsides so that the yield is more than could have been obtained by also cropping the area thus reserved, and, of course, at less cost of cultivation. The hillsides are so steep that it is impossible to cultivate them with modern machinery, and this is done with antiquated mule-drawn plows, while the crops are harvested with the scythe and cradle.

CONVENIENT SPEED INDICATOR IS OF SIMPLE DESIGN

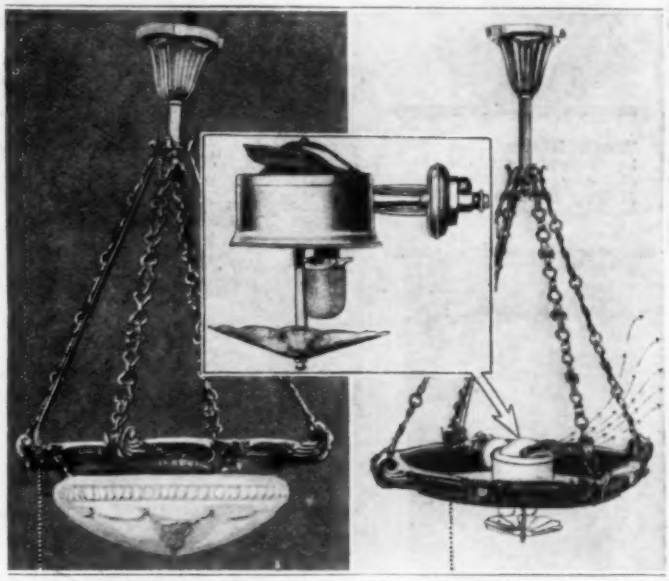
A speed indicator now being placed on the market accurately determines the revolutions of engines, motors, shaftings, and the like. A small inside dial registers every 100 revolutions up to 5,000 revolutions, although higher speeds can be easily determined, and figures showing through windows on an outer dial indicate every five revolutions. Two arrows indicate the figures to use according to the direction of rotation, and the dial is quickly reset to zero.



This New Speed Indicator of Simple Design Has, among Other Features, a Fiber Handle That Is an Insulation against Electricity

NEW GAS BURNER PROTECTS FIXTURE AND CEILING

The use of the ordinary mantle gas lights is invariably accompanied by the nuisance of dust collections on the fixture above the flame and on the ceiling. A remedy for this annoyance has been produced. This remedy consists of a specially designed burner which deflects the heat from the gas flame, so that it is projected at an angle, outward from the fixture. By this method, the heat, with the accompanying dust particles, does not come in contact with the fixture and cools considerably before reaching the ceiling. An added feature of the burner is a small mica baffle, or saucerlike container, suspended so as to catch the mantle when it, from age or any other reason, falls from its holder.

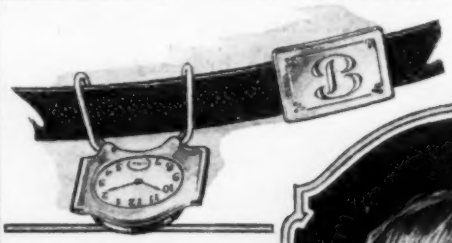


Left: Gas Fixture Completely Assembled. Right: Fixture with Bowl Removed, Showing the Heat-Deflecting Burner. Insert: Close-Up of Heat-Deflecting Burner, Mantle, and Saucerlike Mica Container

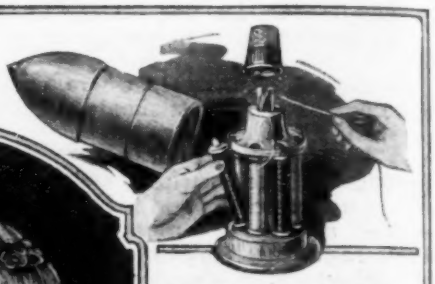
DONATION TO LEPERS' COLONY BY KNIGHTS OF PYTHIAS

The Supreme Lodge, Knights of Pythias, has donated $1,000,000 to the colony of lepers on Culion Island, in the Philippines. The money is to be used for building living quarters for the white lepers, to be known as "Stevens Memorial Hall"; for the establishment of an experimental laboratory for trying to find a leprosy cure, and to provide an endowment fund of approximately 900,000 dollars.

SOME NOVEL AND LITTLE-KNOWN ACCESSORIES



Watch Holder That may be Slipped over the End of Any Ordinary Belt, Making It Handy for Sport Uses

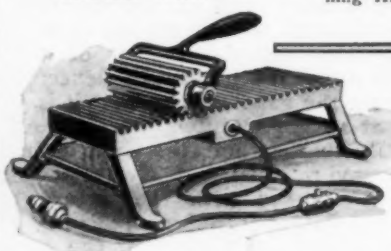


Small, Compact Sewing Kit, Containing a Thimble, Needles, and a Number of Small Thread Spools

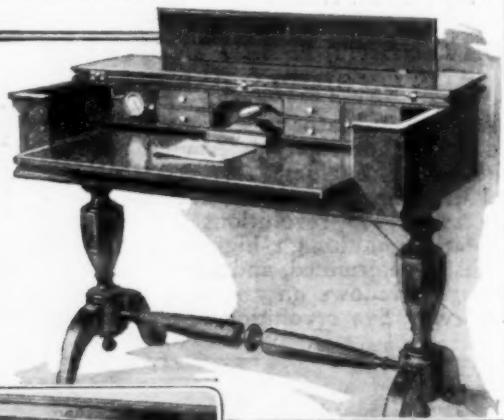
This Holder for Two Ice Picks and Coupon Book is Made of Tinplate, Enameled White

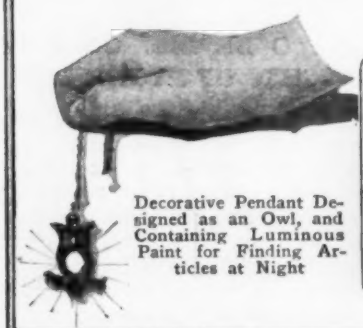
Silk Wig, Pale Pink in Color and Having a Wreath of Small Blue Flowers: These Wigs, Also Made in Various Other Delicate Tints, Are in Vogue at Evening Affairs in London, England

Wastepaper Basket with a Flat Side So That It will Fit Closely against a Desk or Wall, Out of the Way

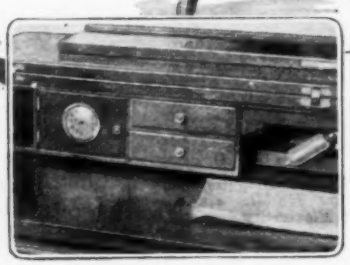


An Electric Fluting Iron with Which Curtains, Collars, Cuffs, Blouses, and the Like, may be Crimped





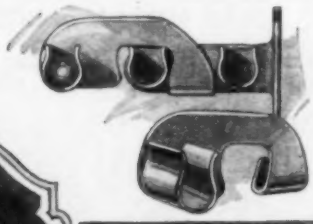
Decorative Pendant Designed as an Owl, and Containing Luminous Paint for Finding Articles at Night



Writing Desk That Contains All the Usual Accessories Found in This Type of Furniture, and Also Has a Miniature Electric Light and a Small Built-In Clock: At the Left Is a Close-Up, Showing Part of the Desk, and Clearly Illustrating the Built-In Clock and Electric-Light Bulb

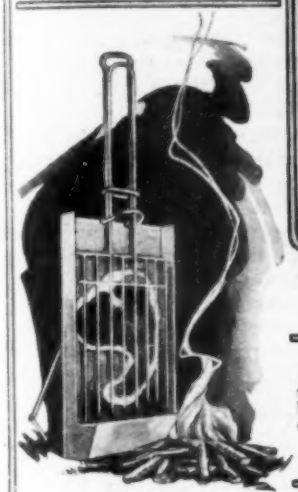
Anyone wishing further information on devices described in the editorial pages can

Convenient Wristlet Made of Leather or Silk Ribbon, That Buckles On and is Used for Carrying a Fancy Handkerchief



Curtain-Rod Brackets with Which the Capacity for Hanging Curtains or Drapes may be Doubled or Trebled

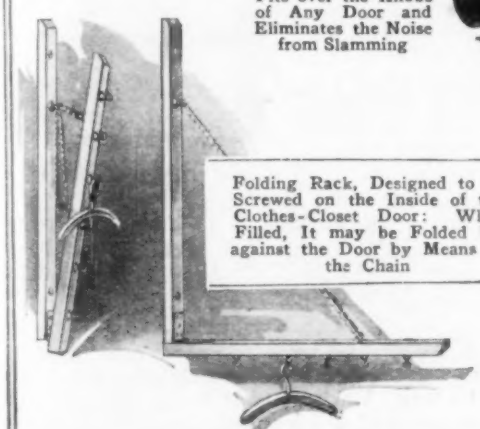
Attachment for Threading the Shuttle of a Tatting Outfit, Which may be Fitted to the Flywheel of a Sewing Machine: Two Movable Clasps Hold the Shuttle, Which is Filled in a Few Seconds



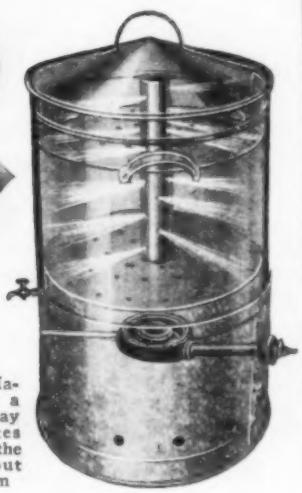
Open-Fire Broiler with Which the Camper or Picnicker may Prepare the Food without Having to Bend over a Smoky Fire

Saving Arrangement for the Housewife, That Aids Her in Placing a Small Amount Aside Each Week for the Systematic Paying of Accounts

Door Silencer That Fits over the Knobs of Any Door and Eliminates the Noise from Slamming



Folding Rack, Designed to be Screwed on the Inside of the Clothes-Closet Door: When Filled, It may be Folded Up against the Door by Means of the Chain

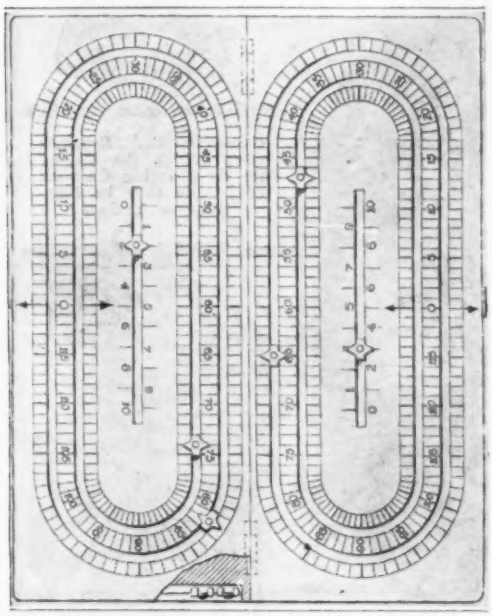


This Washing Machine Produces a Gas-Heated Spray That Percolates and Cleanses the Clothes without Agitating Them

obtain it by addressing Bureau of Information, Popular Mechanics Magazine, Chicago.

OBLONG CRIBBAGE BOARD HAS METAL "PEGS"

Baby, in a playful mood, may sweep the board to the floor, or the players may

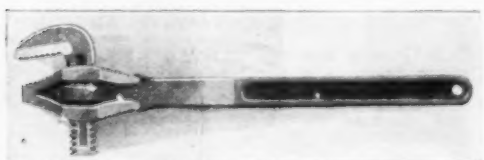


The Metal "Pegs" of This Cribbage Board Slide along a Marked Runway and cannot Fall Off. Extra Pegs are Kept in the Center

bring about a similar mishap, but the "pegs" of a new cribbage board will remain in place until deliberately moved. The board is oblong and has a marked runway for metal pointers which grip tightly. Extra pointers are kept in a socket in the center. If desired, the board can be folded and carried in an inside or outside coat pocket.

SIMPLE PIPE WRENCH MADE WITH ONLY THREE PARTS

A new form of pipe wrench, recently produced, is very simple in construction, for it has only three parts—a handle, a movable jaw, and a knurled nut for adjusting it. At the end of the handle, forming one jaw of the wrench, are two sets of teeth on the smaller sizes, and four on the larger. The movable jaw slides through the handle at this point, and is threaded to fit the adjusting nut operating in an opening in the handlebar. The movable jaw can be placed on either side of the handle, pointing upward for ordinary work, or downward for allowing the wrench to hang upon a pipe while the operator is engaged on other work. The duplicate sets of teeth double the life of the wrench.



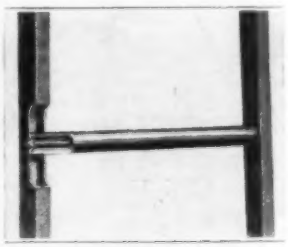
One of the Larger-Sized Wrenches, with Four Sets of Teeth for Using the Wrench in Four Different Ways by Adjustment of the Movable Jaw

LINENLIKE COLLAR CLOTH IS EASILY CLEANED

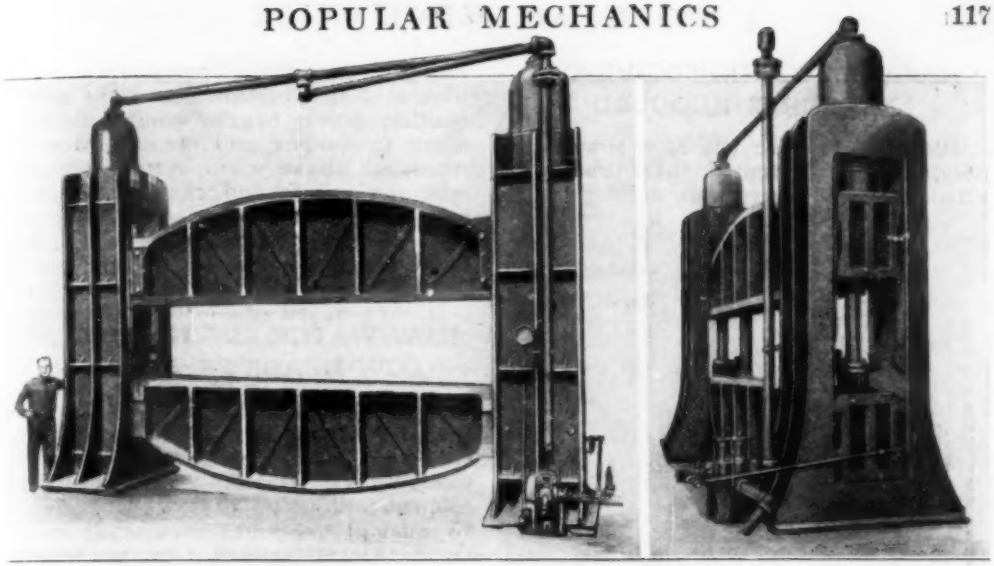
Linenlike collar cloth, every thread of which is permanently insulated against stains and dirt so that these do not penetrate but affect the surface only, is a new development. When made up, the product appears to have all the desirable characteristics of the linen and semistiff tailored collars. Sample batches of this linenized cloth have been thoroughly tested in various steam laundries, with the result that stains, of the kinds ordinarily the most troublesome to be removed, have been taken out without difficulty or injury to the material.

STEEL TUBULAR LADDERS ARE LIGHT, STRONG, AND RIGID

Steel tubular ladders that are as light as wooden ones, and much stronger and more durable, are now being manufactured. The tubular rungs are inserted in holes in the oval-shaped hollow side members, to which they are bolted with long tie-rods, extending clear across the ladder and threaded at each end for nuts that are screwed tightly against the outside. The ladders are made of specially tempered steel, making them very strong and rigid in proportion to their light weight.



¶ According to a recent decree, French airships must have a certificate from the Bureau Veritas, which is the French equivalent of Lloyds, stating that they are fit for service.



Left: Hydraulic Flanging Press from the Front, Its Immense Size Illustrated by Comparison with a Man's Height. The Controlling Hand Lever may be Seen under the Gauge. Right: End View of the Press, Showing the Huge Cylinders at the Top, with the Smaller Ones and the Poppet Valve Below

HYDRAULIC FLANGING PRESS HAS SIMPLE CONTROL

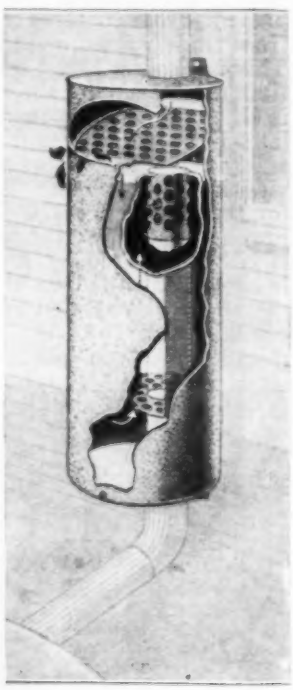
A hydraulic inverted flanging press, which exerts a pressure of 1,500 pounds per square inch, has recently been placed in service. The huge machine was designed for flanging steel plates for car ends, and is constructed of open-hearth steel castings. A pressure aggregating 435 tons is obtained from the inverted hydraulic cylinders which operate the platen, or upper part, while two smaller auxiliary cylinders restore this to the starting position. The press is open and accessible at both sides. The operation of the gigantic outfit is controlled through a three-way poppet, or lift, valve by means of a single hand lever.

CANADIAN SCHOONER WINNER OF CHAMPIONSHIP TROPHY

As the result of the final race sailed off the port of Gloucester, Mass., October 26, when the "Bluenose," of Lunenburg, defeated the Gloucester schooner "Henry Ford," the trophy emblematic of the fishing-schooner championship of the north Atlantic goes to Canada. Besides the trophy, the Canadian winner gets a purse of $3,000, while the loser receives $2,000. The "Bluenose" was the winner last year, having defeated the Gloucester schooner "Elsie," off Halifax, N. S. The first contest for the trophy was sailed in 1920, and was won by the Gloucester schooner "Esperanto," which later foundered off Sable Island.

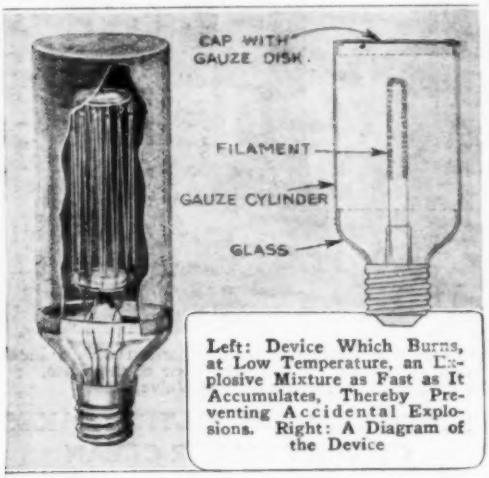
SELF-CLEANING FILTER MAKES CISTERN WATER CLEAN

In a new cistern filter, water entering at the top from a downspout flows over a slanting screen, which allows leaves and coarse material to be washed out through an outlet near the top. The water with fine dirt passes down into a chamber at the bottom, and, as the rain increases, rises through an inner charcoal chamber and reaches the cistern through an interior pipe. When the rain ceases, the clear water in the charcoal chamber backwashes the sediment through a small hole at the bottom of the filter, which is constantly draining sediment at a loss of about 10 per cent of water.



HAZARDS OF EXPLOSIVE GAS MIXTURES REDUCED

It is believed the use of a simple device, recently invented, will practically eliminate the dangers from accidental explosion in mixtures of air and gas frequently found in mines, sewers, tunnels, and other inclosed spaces where gas is present from natural causes or results from trade wastes or industrial processes. This method is based on the idea of continuously removing the explosive mixture itself, more rapidly than it can accumulate, by burning it up at a temperature safely below the explosion point. The device has an ordinary electric-lamp base for connection to a 110-volt circuit for the purpose of heating the coil filament, which is either inclosed by a solid porous cylinder or sheathed in porous tubes, and the whole surrounded by wire gauze. The essential feature of this device is the application to the porous surface, of a catalyst which makes possible the oxidation, at a temperature below the normal ignition point, of the combustible elements in the gas, and the control of the resistance of the whole system so that it takes on a safe and effective operating temperature. The temperature found to be most satisfactory, when using platinum as a catalyzing agent, lies between 1,100 and 1,450° Fahrenheit.

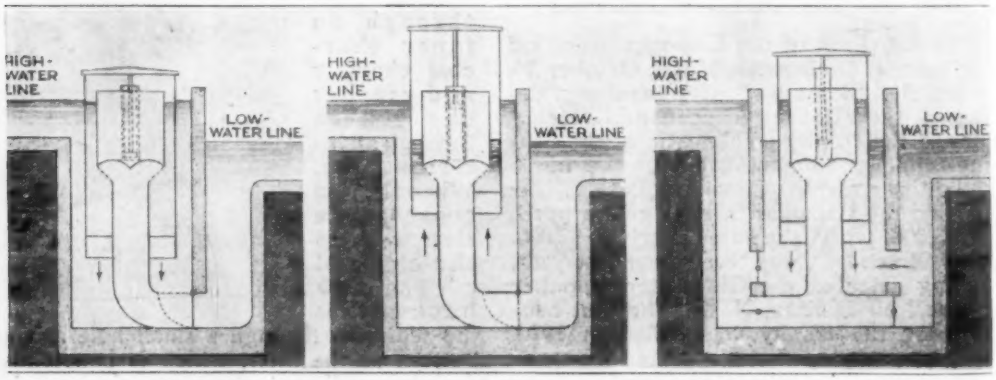


Left: Device Which Burns, at Low Temperature, an Explosive Mixture as Fast as It Accumulates, Thereby Preventing Accidental Explosions. Right: A Diagram of the Device

NEW WATER ENGINE UTILIZES LOW HEADS EFFICIENTLY

Water-power development has been limited, until recent years, to using considerable differences in water level, because no water motors were available for efficient utilization of low water heads. Gradual progress has been made in this direction, and now a German has designed a water engine for transforming the potential energy of low and varying heads, such as exist in small streams and at the tides, efficiently into useful work.

The engine is placed in a pit, which forms part of a dam construction to maintain the difference in water levels. The pit is directly connected to the higher level, and to the lower level by means of an ascending canal. In the pit is fixed a vertical pipe, which is either in communication with the pit or the discharge canal, according to the position of a swinging valve. Sliding up and down this pipe is a drum, the weight of which is nearly balanced by an air chamber in its lower end, but when the level of the water inside the drum is the same as that in the pit, there is still enough unbalanced weight in the drum to cause it to sink to the end of its travel. Then the valve is turned so that the water in the drum will run out of the pipe to the lower level, when the pressure of the water at the



Left: New Low-Head Single-Acting Water Engine on the Down or Working Stroke. Center: Same Engine on the Upstroke. Right: Similar Engine of the Double-Acting Type

higher level in the pit, acting on the outside under surface of the drum, forces the drum up, completing the stroke. The stroke of the engine is independent of the difference in water level, being limited by the depth of the pit and dimensions of the engine. A double-acting engine can be made by placing it in a pit connected by two canals and with a slightly more complicated valve arrangement. The engine can be attached to a pump for supplying water directly, or to pump water at high pressure into a storage reservoir, from which the water can be used to drive water wheels, which in turn may drive electric generators or other machines. The efficiency of this water engine is said to be between 70 and 80 per cent, and even as high as 90 per cent where the expense of installing large slow-running engines is warranted.

SAFETY HOIST HOOK CANNOT UNLOCK WHEN LOADED

For safeguarding the operator, a hoist hook that cannot unlock when under tension, is now on the market. The sling chain carrying the load cannot be placed in the hook unless it is securely locked. The body parts of the hook are drop forgings of steel of a very high tensile strength, and the pivot pins are made of noncorrosive metal with great resistance to shearing stress.

NEW PROCESS RECLAIMS ALUM FROM FILTRATION PLANTS

A process by means of which practically all the alum used in the filtration of water can be recovered and reused, has recently been developed and adopted by the waterworks department of Atlanta, Ga. This process, the discovery of which was purely accidental, consists in treating the sludge from the settling tanks with sulphuric acid. A by-product obtained in the form of a finely divided pure-white clay, highly prized in the ceramic arts, is claimed to pay for the sulphuric acid and the labor of recovering the alum.

TABLE AND FOUR CHAIRS CARRIED IN NEAT KIT

A five-piece "dining-room set" which can be folded into a small flat case is the latest innovation in camp equipment. Simplicity is secured by having the table in only two parts; the chairs in one. The table is the height of an ordinary dining table and so constructed that the legs are out of the way. Canvas is used for the seat of the chairs. Both table and chairs are heavily enameled to protect them against rust.

Camp Table That Folds So as to Make a Neat Case, 27 Inches Long, 7 Inches Wide, and 2 Inches Thick: Chairs are Carried Inside

DETACHABLE INK FOUNTAIN FOR ORDINARY STEEL PEN

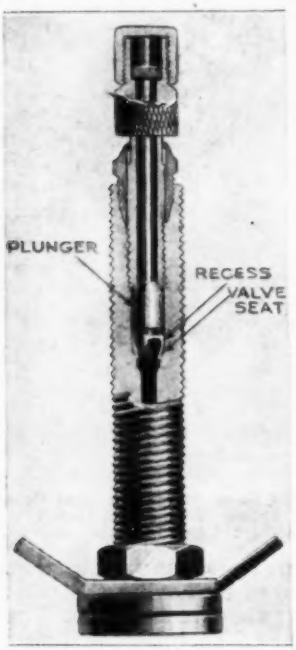
From 500 to 800 words, it is claimed, can be written without refilling with the aid of a small spoonlike fountain, the handle of which fastens into the penholder directly under the pen. The fountain part touches the pen near its point.

With the Little Cup Placed under the Regular Pen, as Shown, 500 to 800 Words can be Written with One Filling

¶Write our Bureau of Information, if you wish to know who makes or sells any article described in this magazine. Send no postage; the service is free.

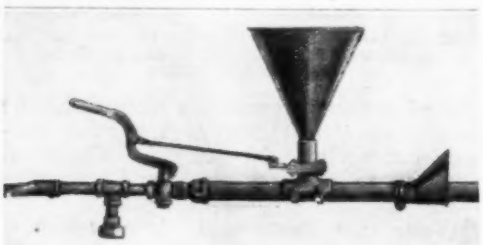
RECESSED FLEXIBLE VALVE FOR PNEUMATIC TUBES

Automatic in its action, a new all-metal valve for the pneumatic tubes of automobile tires is so constructed that it will positively retain any desired air pressure, independently of back pressure from within the tube. At the end of a plunger is a novel kind of valve that is recessed so that it is flexible, making it sufficiently elastic to form a perfect seal without being ground into the valve seat. The valve is opened, or positively held closed, by turning a threaded sleeve with a knurled head on it. At the upper end of the valve plunger is a second seat that acts as a check, preventing the escape of air while the tire is being inflated.



SOOT BLOWER CLEANS TUBES WITH SAND BLAST

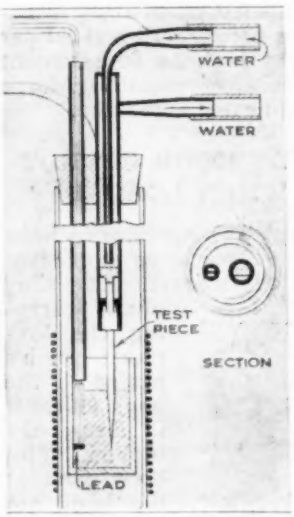
A device has recently been invented for removing soot from boiler tubes by means of a steam and sand-blast action. A whistle valve for admitting steam into the blower pipe, is operated by the same lever that controls the gate under the sand hopper. The device is of very simple construction and can be quickly converted into a straight steam or air blower by removing the sand hopper. With its use, hand scrapers and brushes can be eliminated, as the sand blast is said to remove effectively all soot and incrustation from the surface of the tubes, if used once a week.



This Simple and Effective Soot Blower can be Operated as a Plain Air or Steam Blower, or with a Sand-Blast Action

TO IDENTIFY SPECIAL STEELS BY THERMOELECTRIC TEST

Because hardness tests do not serve completely to identify special steels, experiments have been performed in search of a test method that would make such identification complete and positive. The method adopted depends on the amount of thermoelectric force generated when one end of the test piece is heated while the other end is kept cool. A bath of mercury is employed for heating one end of the test piece and for making connection to the voltmeter. The other connection is made to a water-cooled metallic clamp attached to the other end of the piece. This test has shown very promising results.



PLAN LARGEST FLYING FIELD AT DAYTON, OHIO

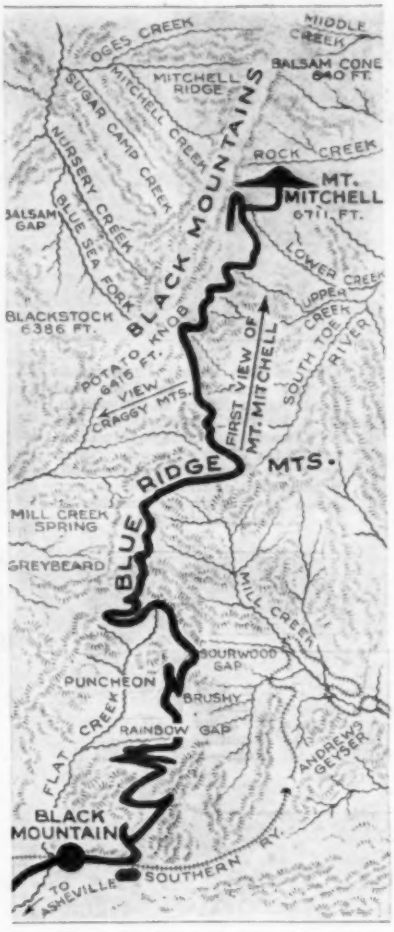
Announcement has been made that the largest flying field in the United States is to be established on a recently purchased large tract of land east of Dayton, Ohio. It is planned to move McCook Field, now the center of experimental work for the United States Air Service, to the new site and to include the famous Wilbur Wright Field. There has also been some indication that an air academy may be established at the McCook post. A number of citizens of Dayton bought the site and offered it to the government.

EIGHTEEN-MILE ONE-WAY ROAD TO MT. MITCHELL

One-way traffic on an 18-mile stretch of road is the innovation which has apparently solved the safety problem on a much-traveled mountain thoroughfare, near Asheville, N. C. Too narrow for vehicles to pass, and abounding in sharp curves, the road would present many elements of danger if traffic were permitted to move in both directions at one time.

A solution was found by restricting the travel to ascending traffic during the morning hours and to descending during the afternoon. That this plan was good was clearly demonstrated by the absence of auto accidents on the road during the tourist season of 1922.

The road on which this traffic problem has been so well solved leads to a point near the summit of Mt. Mitchell, one of the highest peaks east of the Rocky Mountains, 6,711 feet above sea level. In its length of 18 miles the road climbs almost 4,400 feet, giving an average grade of 3½ per cent. To build such a highway for tourists and sight-seeing traffic ordinarily would have involved a prohibitive outlay for construction work.



The Mountain Road, Shown Here, Runs to the Summit of Mount Mitchell, near Asheville, North Carolina, Climbing More than 4,000 Feet in 18 Miles. Only One-Way Traffic is Permitted

The roadbed, however, was originally made for a steam railroad used in lumber operations. After the railroad had served its purpose, rails and ties were removed and the roadbed converted into a cinder-surfaced driveway of easy grade, and with stout bridges where needed. It makes a beautiful mountain ride. At four different places the road crosses the Blue Ridge Mountains, the divide for waters flowing to the Atlantic and the Mississippi.

For ascending travel the road is open during the summer season from 8:00 a. m. to 1:00 p. m., while for descending motorists the hours are 3:30 to 5:30 p. m. The downward journey may not be undertaken until the gate at the summit is thrown open. As a further safeguard against mishap, a traffic officer starts from the lower gate at one o'clock and travels to the top in a car known as "the trailer," to make sure that descending motorists will encounter no cars which may have been crippled during the upward journey.

If "cripples" are found, the crew of the trailer immediately renders first aid by fixing the engine, or if necessary, by towing the car in. When the trailer arrives and reports the way clear, the gate is opened for descending travel, but never before.

ATTACHMENT ON FARE BOXES DISPLAYS BOGUS COINS

Thousands of bogus coins in the shape of iron slugs, brass hat checks, etc., have been dropped into the fare boxes of the New York subway lines. These frauds are now, in some measure, safeguarded against. The remedy consists in the installation on the turnstile of an electric light equipped with a bull's-eye lens and so located that a greatly magnified image of the article deposited is pictured on the glass front of the coin box. Inspectors stationed a few feet from the boxes may thus readily detect any counterfeits. To protect innocent persons who, from hurry or absent-mindedness, drop in a penny or a dime, the equipment contains an automatic appliance which rejects coins that are larger or smaller than the required nickel.

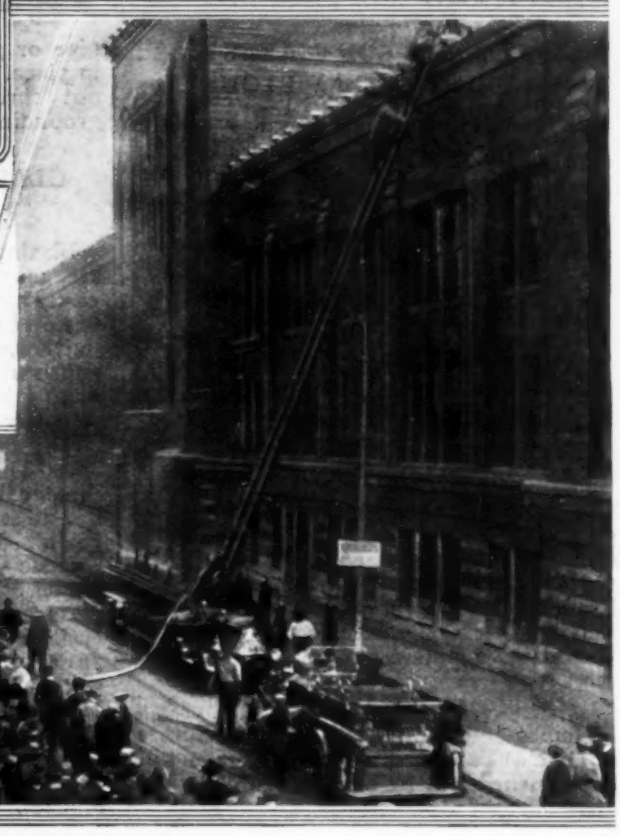
Above Is a Portrait of an 11-Year-Old English Boy Who has Performed the Remarkable Feat of Walking from Manchester to Southport, a Distance of More than 39 Miles, in 8 Hours 33 Minutes 35 Seconds, Being an Average of About 4½ Miles an Hour—a Remarkable Record for a Boy

One of the Latest Innovations in the Industry Is This Doll Made as an Exact Reproduction, on a Reduced Scale, of Its Little Owner. A Photographic Likeness of the Child's Face is Printed upon the Blank Face of the Doll, Whose Hair and Clothes are Made as Similar as Possible to Those of the Child

This Is the Novel, Realistic Method of Teaching History at a Public School in Sydney, Australia. Historical Incidents are Enacted by the Students, as Shown Above, Where a Band of Boys, Made Up as Natives and Brandishing Their Spears, are Attacking a Party of Explorers Armed with Popguns and Other Weapons

This Young Lady is Wearing a Fancy Ball Dress That Symbolizes the Radio. She Wears Head Phones with the Antenna Supported above Them, and on Her Dress Are a Tuning Switch and Other Radio Devices

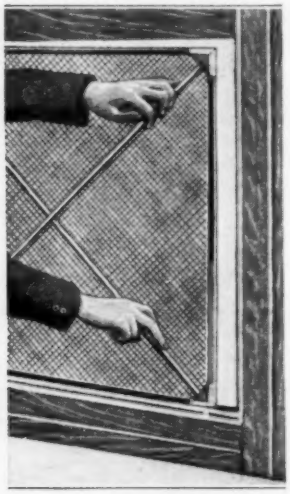
In a Campaign against Vivisection in California, Where a Law was Proposed to Prohibit This Practice on All Animals under All Circumstances, the Children of the State Actively Took the Part of Their Pets, Asking Their Elders to Vote for the Law. Pictured to the Right Are Two Examples of Their Campaign Methods, in Which, Whenever Possible, Dogs and Puppies Took Part



Fire Drill of a Very Realistic Nature at the Lane Technical High School, Chicago, Illinois: Fire was Imitated by the Use of Smoke Pots, Placed on the Window Sills, Which Discharged a Black Pall of Smoke, Illumined by Flashes of Flame. The Picture Shows the Fire Department at Work after the Orderly Escape of the 4,500 Students in Less than Three Minutes

ADJUSTABLE WINDOW SCREEN VERY CLOSE-FITTING

An adjustable screen for window casements has its metal frame so constructed that, when the window is pulled down onto it, the pressure expands the screen sideways, making such a perfect fit all around the screen that it is not possible for flies or mosquitoes to enter. To remove it, two cross rods that connect the four corners of the frame are pulled sideways, causing the screen to expand upward.



RING COMPRESSOR MAKES EASY INSERTION OF PISTONS

A new device, which operates on the contracting-band idea, can be used for installing pistons in gasoline engines, either from the top of the cylinder or through the crankcase. The band that grips the piston rings is made of phosphor bronze in corrugated form, and has a range that enables it to grip pistons up to 5 inches in diameter. A universal-jointed shaft operates the steel spool to which one end of the band is locked, and the free end of the band, which encircles the piston, is hooked to a pin in the steel housing of the spool.

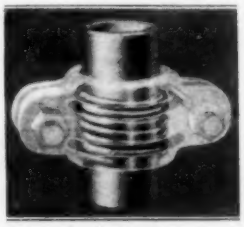
¶Names and addresses of manufacturers of articles described in this magazine will be furnished free by our Bureau of Information.

BURNING WIRE INSULATION PRESENTS ODD SIGHT

An odd sight was presented to the interested onlookers at a recent fire, when the insulation burned from a number of electric wires in front of a blazing building in Pueblo, Colo. The covering flickered and smoldered with a peculiar reddish glow intermixed with a thick gray smoke, the insulation dripping to the sidewalk and the wires ultimately burning bare for a distance of two blocks.

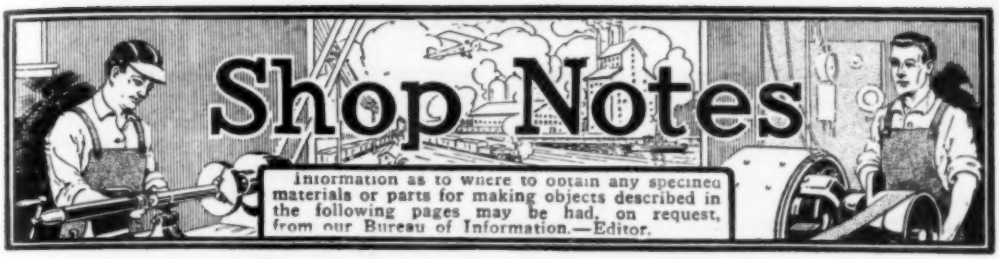
EFFICIENT GROUNDING CLAMP FOR ELECTRICAL WORK

An efficient clamp, made of malleable iron and in two parts, which may be fastened together by a pair of bolts, is an improvement produced for the necessary "grounding" of electrical installations. By its use, seven full turns of wire may be placed around a pipe or grounding rod and held securely in place. One end of the wire is brought out through the clamp, so that the grounding wire may be soldered thereto.



GLASS FIRE EXTINGUISHER EASILY HANDLED

Blazing oils, wood, or even an electric arc, may be effectually "put out" by an easily handled fire extinguisher, which consists of a glass container partly filled with chemicals. The appliance is similar in shape to a large electric-lamp bulb. The glass container is made in three sizes, suitable for the home, business, or motor car, and is provided with a simple mounting bracket.


Shop Notes
Information as to where to obtain any specified materials or parts for making objects described in the following pages may be had, on request, from our Bureau of Information.—Editor.

A Rural Mail-Box Post of Concrete

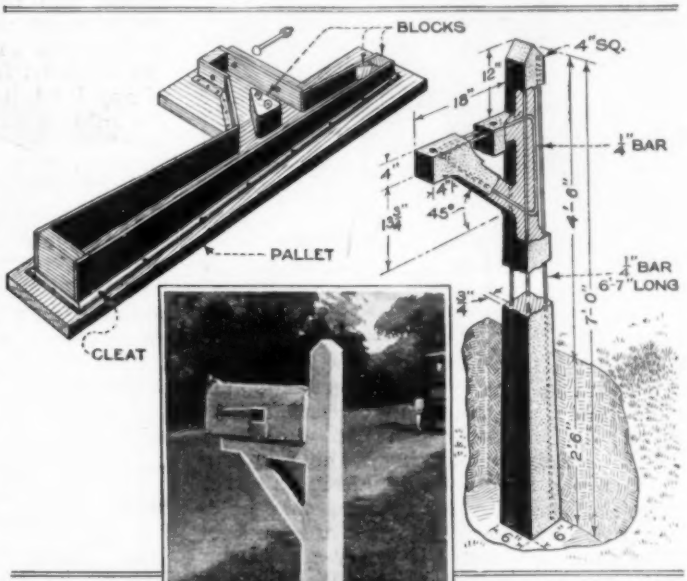
By A. J. R. CURTIS

PROGRESSIVE farmers and villagers all over the country are discarding the old makeshift wooden mail-box post, and substituting for it the modern concrete post, which is attractive in appearance, and is neither affected by frost, attacked by rot, nor likely to be destroyed by fire.

Any farmer with a little time to spare can make the post described in this article at home. It is so simple in construction that it is suggested as an excellent manual-training exercise for rural-school students.

The accompanying drawings show how the post is constructed. The form is built up on a floor having a level and regular surface, or on a pallet or mat of boards, 8 ft. long and at least 30 in. wide. If a floor is used, a strip of building, or other heavy, paper should be used as a covering. The form consists simply of a few wooden strips (dressed on all surfaces to be touched by the concrete), held in position by cleats lightly nailed to the floor or pallet. The post is cast on its side. Prepare first two pieces of 1-in. board, 7 ft. 4 in. long, 6 in. wide at one end, and tapering to a width of 4 in. at the other. Finish and sandpaper the opposite faces of each. One of these strips serves as a form for the straight, plain side of the post. The other serves as a form for the opposite side of the post, being cut as required, and joined to smaller pieces, of similar material, to make the entire outline of the bracket and shelf. The form for the interior triangle is best made from a block with a small amount of taper, so that it can be withdrawn upward. This piece in particular must be well greased and sandpapered, and screweyes should be inserted in the top to make its removal easier.

The longitudinal strips are held apart by square blocks inserted between them at the lower and upper ends. Triangular blocks, inserted at the upper end, form the upper corners of the post, as shown.



An Attractive and Easily Made Rural Mail-Box Post of Concrete:

A Post of This Type Is Far Superior to the Usual Wooden One, and Is Simple Enough for a Boy to Make

The reinforcing in the post consists of four ¼-in. round bars, 6 ft. 9 in. long, placed symmetrically at the four corners of the post, ¾ in. in from the surfaces. The bracket and shelf are reinforced with two triangles made of ¼-in. bars, bent as shown, and inserted in the mold one above the other, 1 in. away from all outer surfaces. The bolts to which the mail box is attached are placed through the molds before the concrete is deposited.

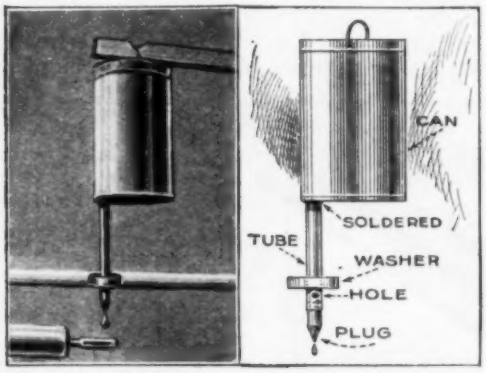
The concrete for the post is mixed in the proportions of 1 part Portland cement to 3 parts well-graded sand, under ¼ in. in size, or 1 part Portland cement to 2½ parts sand and 1 to 2 parts of crushed stone, or pebbles, from ¼ in. to ½ in. in size. The mixture must be made just wet enough to flow freely to all parts of the mold. The mold is well greased before the concrete is poured.

In moderate weather, allow the post to remain at least three days before attempting to raise or remove it. In cool weather, wait four or five days. At the end of that time move it only with great care, as posts that later become very strong and hard are easily injured by careless handling while "green."

As soon as the mold is removed, brush and scrape off fins and other blemishes, and fill up holes and hollows with the same mixture as used in the post. Then paint the surfaces with a creamy mixture of cement and water, and store the post where it will not be exposed to sun, wind, or frost, or subject to strain.

A Simple Drip Can

The drip can shown in the illustration has been used for a considerable time for



Simple Drip Can for Supplying Oil and Cutting Compounds to Taps in a Tapping Machine, Using Improvised Supply-Regulating Valve

supplying oil and cutting compounds to taps used in a tapping machine, and has been found to give as much satisfaction as any device on the market.

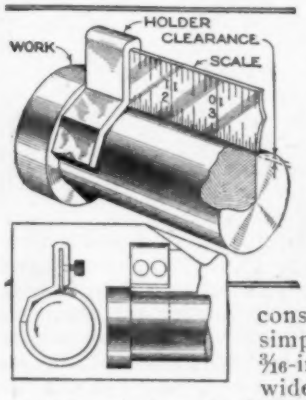
It is made by piercing a hole in the bottom of a tin can and soldering a short length of copper tubing into this hole. A wooden plug, pointed at one end, is driven securely into the lower end of the tube, and a small hole is drilled in the tube just above the plug. The amount of liquid flowing out of this hole is controlled by covering the hole more or less with a leather or rubber washer that slides snugly on the tube.

Steel Rivets Damage Brake Drums

It is a very poor policy to substitute common steel rivets for copper and brass ones where the latter are used for a special reason, as, for instance, in relining brake and transmission bands. Here such substitution will entail considerable unforeseen expense. This was the case when, in making repairs on a light car, it was found that the brake, slow-speed, and reverse drums were deeply grooved by the steel rivets used in lining the bands, making it necessary to remove the motor in order to replace these parts. Copper or brass rivets should be used under all circumstances when relining bands, and one should make sure that they are not copper-coated steel rivets by cutting one in two. Before substituting one material for another, in repair work of any kind, it should be ascertained that the substitution will not be harmful.

Scale Holder for Lathe Use

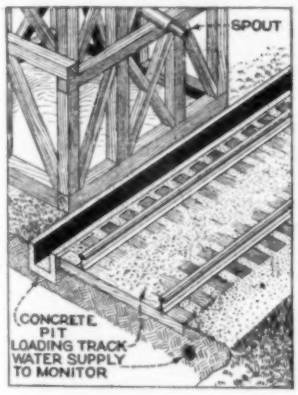
Much lathe work requires to be turned with a shoulder a definite distance from the end. When facing a shoulder to length, it is necessary to stop the lathe repeatedly in order to measure the distance, as while the machine is in motion, the scale cannot be applied with any degree of accuracy, apart from the danger involved due to the tendency of the scale to catch the work. With the holder shown, however, the user can measure the work without stopping the lathe at all, saving a good deal of time and trouble where much work of this kind is done. The construction is very simple; a piece of 3/16-in. stock, 1 in. wide, is bent to form a "V," and then doubled over, as shown, to fit the scale. The side of the holder that bears against the shoulder is finished square with the V and the scale



slot. Two knurled screws are used to hold the scale in place. When attaching the holder to the scale, it should be laid on the work, close to the shoulder, whereupon the scale, with its bottom just clear of the work, is pushed in to touch the shoulder lightly, and the two screws are tightened. Any number of pieces can then be turned and measured with the lathe in motion, the scale being held exactly in line with the work, insuring accurate results. The holder, of course, should be casehardened.

Clearing Sand from Loading Tracks to Prevent Derailment

Derailment of cars, due to an excessive amount of sand and gravel on the loading tracks at material yards, is not an uncommon occurrence. An inexpensive method of keeping the tracks clean was devised by a large building-material concern, and is shown in the drawing. A narrow concrete pit or trough was built on one side of the tracks; this drained into a waste basin. After a car had been loaded, the tracks were flushed by means of a stream of water, directed from a monitor nozzle set on the outer side of the track. The water and sand run into the concrete trough and to the waste basin.



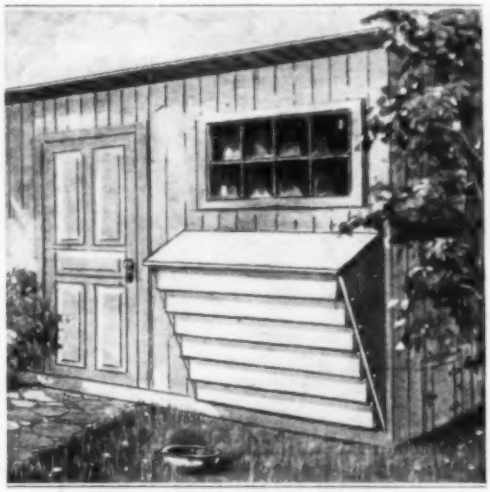
Imitation Ice for Window Displays

Imitation ice adds to the effect of window displays that advertise skates and other outdoor winter goods. It is usually made with pieces of plate glass, to which a "frosty" effect is given by sprinkling fine flakes of mica on the glass, after it has been painted with a thin solution of glue and water.

In order to make this imitation ice look as real as possible, the plate glass should be given a bluish hue by mounting it on light-blue crêpe paper, stretched tightly under the glass to eliminate the wrinkles.—H. Webster, Winnipeg, Can.

Automatic Ventilator for Poultry Houses

Most poultrymen today acknowledge the value of good ventilation in the winter laying pens. But ventilation without objectionable drafts is often hard to accomplish, especially where snowstorms and blizzards are of frequent occurrence. The open-air type of henhouse, which is in general use, is not entirely satisfactory because snow and rain can enter. Even if a muslin curtain is provided to prevent this, it is necessary to adjust this curtain according to weather conditions, and this is very often neglected. To overcome these difficulties, and to make the ventilation entirely automatic, a Wisconsin poultryman devised the shutter arrangement shown in the illustration.



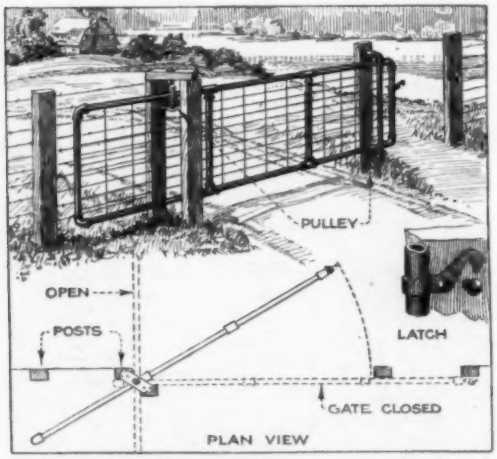
A Shutter for the Poultry House That, While Providing Ample Ventilation, Eliminates Draft, as It Closes Automatically in a Wind

It consists of a frame projecting from the side of the poultry house as shown, about 6 ft. long and 4 ft. high, roofed over with tar paper. Seven 6-in. boards are suspended within this frame, with enough space between them to insure proper ventilation at all times, and arranged in such a manner that they swing easily upon pivot nails driven through the frame at each end.

In fair weather the shutters hang vertically, but when gusts of wind, with rain or snow, beat against them, they close automatically. To prevent the fowls from scratching litter into the openings, which would interfere with the movement of the shutters, sparrow netting is tacked across the frame, on the inside of the house.—G. E. Hendrickson, Argyle, Wis.

Combination Farmyard Gate

A farmyard gate that answers a twofold purpose is shown in the illustration. One



Sliding and Swinging Farmyard Gate That Serves Both Pedestrians and Cattle, or Vehicles

part is designed for pedestrians, and the other for cattle and farm vehicles.

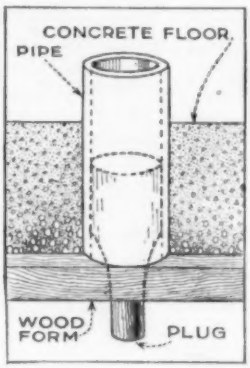
To allow persons to pass through the gate, the latch is released and the gate pushed open; it is set on an incline so that it will close of its own weight. When it is desired to open the entire gate to permit cattle to pass through, it is pushed off the bottom pulley and swung around, which can be done very easily, as the other end of the gate is suspended from a swivel pulley, hung between two posts.

Vacuum Gauge Made from Pressure Gauge

While experimenting with a small ice machine, it was desired to know whether the compressor reduced the pressure sufficiently on the suction side. Two pressure gauges were available, but no vacuum gauge, and accordingly it was decided to try to convert one of these to register the amount of vacuum, if the curved rack that engaged the gear on the indicator pinion was long enough. By removing the glass, indicator hand, and dial, it was easily ascertained that this was so. Satisfied on that point, the pin opposite the zero mark on the dial was removed. Then, as the marking was regular from zero to 250, the dividers were set to indicate 5-lb. pressures and the graduations continued to 15 below zero. The dial was replaced, and, with the outlet open to the atmosphere, the pointer on the spindle was forced to stand at the zero mark. After this the glass cover was put back. On connecting the converted pressure gauge to the suction side of the compressor, the hand barely left the zero mark. The valves were then taken out of the machine and reground, after which everything operated as it should. The marking in this instance was made 15, because it was close enough for the purpose, as the machine functioned perfectly at the 5 mark.

Setting Pipe in Concrete

In the construction of a reinforced-concrete and steel factory building, it was specified that, wherever conduit or other pipe was to pass through a floor, a short piece of pipe having an internal diameter large enough to accommodate the conduit or pipe, should be set. The short pieces of pipe were to be flush with the ceiling on the underside and project about 2 in. beyond the floor above. In most locations, it was difficult to secure these short lengths of pipe so that they would stay exactly where they were placed, and in the majority of cases, it was found that, after the concrete had set, and the forms had been removed, the sleeves had shifted a little, or had risen enough to allow the semiliquid concrete to enter and partly fill the pipe. After a number of faults of this kind had been discovered, the method illustrated was devised and used with excellent results. A block of wood was neatly rounded to slip inside one of the pipes, the other end of the plug being whittled down to fit into an auger hole drilled through the wooden form. A hammer and smaller piece of pipe were used to drive the plug into the hole tightly. It was found that the pipes set in this manner stayed in the exact position in which they were placed.—Leon D. Quick, Milesburg, Pa.

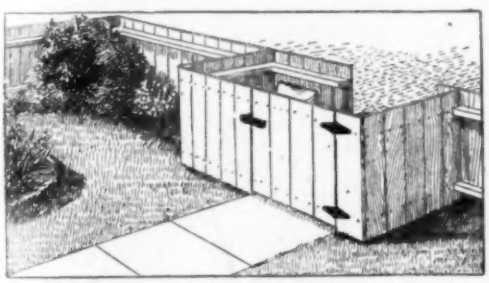


Pricker for Draftsmen

The pricker that is usually included in a set of drawing instruments is rather clumsy to handle, and does not prove very satisfactory to those who find it necessary to use this instrument frequently, as is the case with structural and topographical draftsmen. An extremely handy and serviceable pricker can be made very easily by purchasing a medium-size crochet hook at a dry-goods store, and grinding off the hook, to make a fine, round point. It should be finished on an oilstone to make a good job. This form of pricker will not tire or cramp the hand. —E. D. Hay, Des Moines, Ia.

An Inclosure for the Garbage Cans

It is always desirable to place the garbage cans, and the rubbish that accumulates about the yard, in a part of the yard entirely out of sight from the house. As this was impossible, in one case, because



A Small Inclosure, Used for Garbage Cans and Rubbish, Keeps the Back Yard Neat and Clean

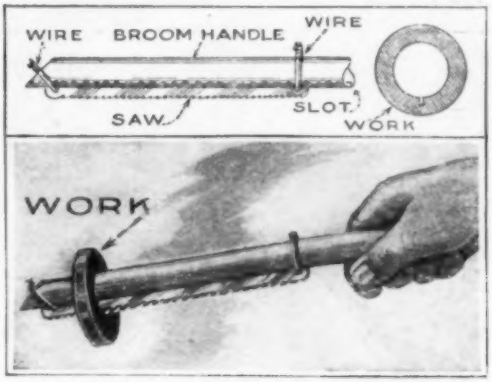
the back yard was so small, an inclosure, 4 ft. by 7 ft., was formed, as shown, inside of the fence that separated the back yard from the alley. The garbage collector need not enter the yard, and as the gate can be kept latched or locked, stray dogs, cats, and other undesirable visitors are kept out.

An inclosure of this type can also be used as a temporary storage place for wood or coal, in cities where it is not permissible to dump material of this kind in the alley.

Sawing Slots in Sleeves and Washers

It is very inconvenient to saw internal slots in washers, or sleeves, by means of a common hacksaw, as the blade must be removed from the frame, inserted through the hole, and again be fastened to the frame. A good holder, that makes this unnecessary, can be made from a short piece of broom handle, about 4 in. longer than the saw blade.

A groove is cut lengthwise in the holder, so that the blade can be inserted to

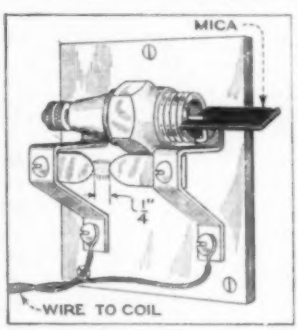


A Simple Tool for Sawing Internal Slots in Washers or Sleeves, Made from a Piece of Broomstick

about one-third of its depth. Soft wire is passed through the holes at each end of the blade and is twisted around the holder. The end of the holder is cut at an angle so that the wire, when twisted around this end, will pull the blade taut.

Spark-Plug Tester Protects Ignition Coil

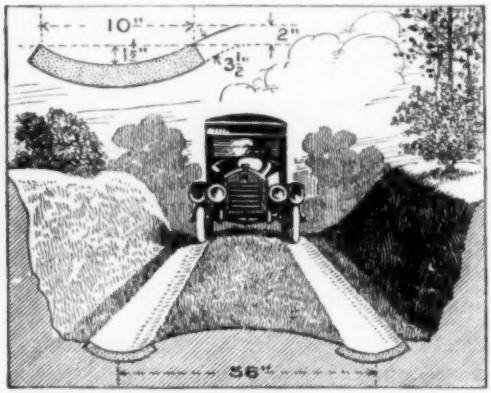
Ignition coils are often injured while testing spark plugs. A plug with defective insulation will often spark under atmospheric pressure but fail to do so when under compression in the cylinder. Therefore, while testing it, a piece of mica is often placed between the points to increase the resistance and cause the spark to jump a gap of ¼ in. or more. Although this is an excellent method of testing spark plugs, the ignition coil is likely to be injured when the spark is caused to jump too far.



By using the simple arrangement shown in the illustration, the danger of coil breakdown is eliminated. The spark plug is placed across two brass brackets, which are mounted on an insulating base, and are fitted with points having a ¼-in. air gap between them. The spark will jump this gap as soon as the gap in the plug is over ¼ inch.

Concrete Wheel Ways Serve as Gutters

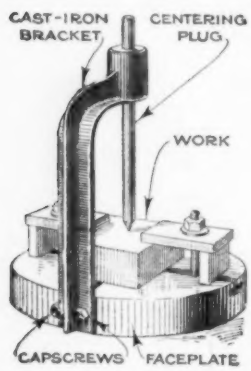
A plain dirt driveway, cut through a bank, was frequently ruined by washouts. As it was not desired to go to the expense of building an entire cement driveway, two concave wheel ways, designed also to serve as gutters, were built, and no more trouble from washouts was experienced. These ways were 10 in. wide and about 3½ in. thick, and made of a circular-arc section, with the center about 1½ in. below the edges. The distance between the centers was 56 inches. The ground between the ways was crowned, so that all the water would be shed into them.—O. H. Hampsch, Nashville, Tenn.



Concave Wheel Ways, That Also Serve as Gutters, Which were Built to Prevent Frequent Washouts That Ruined the Dirt Driveway

Locating Arm for Faceplate Work

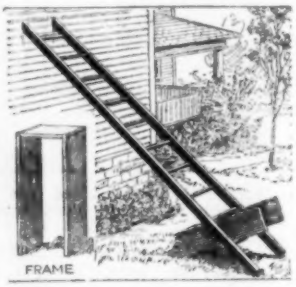
Sometimes it is a very difficult matter to bolt a job on the faceplate of a lathe while the former is on the spindle, and it often happens that it would be more convenient to lay the faceplate flat on a bench and bolt the work to it. When this is done, it generally requires much time and measuring to set the job near the right position. If much of this kind of work is done, a locating arm similar to the one shown in the drawing will soon pay for itself. The fixture consists of a cast-iron arm, screwed to the outer rim of the faceplate. The hole in the hub part is bored out while the arm is in this position, and a centering plug is fitted. The faceplate, after the hub is bored out, can be removed and the job bolted to it. After the work is properly located by the centering plug, the locating arm is taken off and put away. It can be accurately replaced at any time by bolting it to the same position on the faceplate.



Rough work is usually held to the faceplate by the tailstock center, but this device is better when it is desired to preserve the punch mark on work that has been laid out accurately, and when the plate is put back on the lathe and the center mark tested, it will be necessary to move the job only slightly in order to bring the center-punch mark dead true.—Chas. Homewood, Ontario, Calif.

Ladder Wedge Prevents Slipping

It is often necessary to place a ladder at such an angle to the wall that it has a tendency to slip. In such cases an assistant is usually required to hold the ladder firmly on the ground, which naturally increases the cost of the work. For this reason a builder improvised an excellent means of steadying the ladder so that it would not slip on the smoothest surfaces. Three lengths of 1-in. board, slightly less in width than the distance between the ladder rungs, are screwed together to form a U-shaped frame. The simple arrangement is slipped between the two lowest rungs, as shown, and prevents all danger of slipping.—Harry Moore, Montreal, Can.

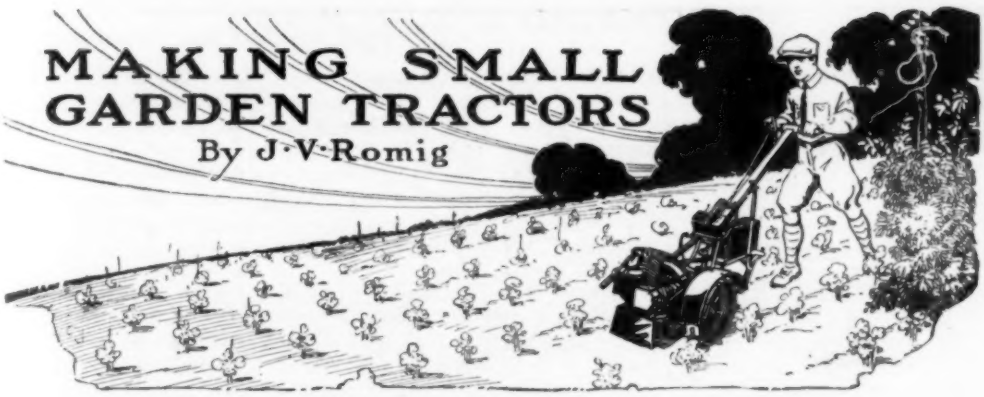


Base for Mounting Maps

When maps are used with the colored push-pin system, as for sales purposes, a substantial base should be provided to prevent the walls or desks on which the maps are kept from being marred. A good base is made by mounting the map on two or three thicknesses of blotting paper pasted together, enough sheets being used to insure that the pins will not penetrate to the surface below.—C. I. Reid, Millersburg, Pa.

MAKING SMALL GARDEN TRACTORS

By J·V·Romig



THE owners of large truck gardens will find that much trouble and hard manual labor can be saved by the use of a small garden tractor. Tractors of this type will run from four to eight hours on a gallon of gasoline, depending on the work, and will do all that can be done with a horse, or even more. Anyone with a little mechanical experience can build the tractors herein described.

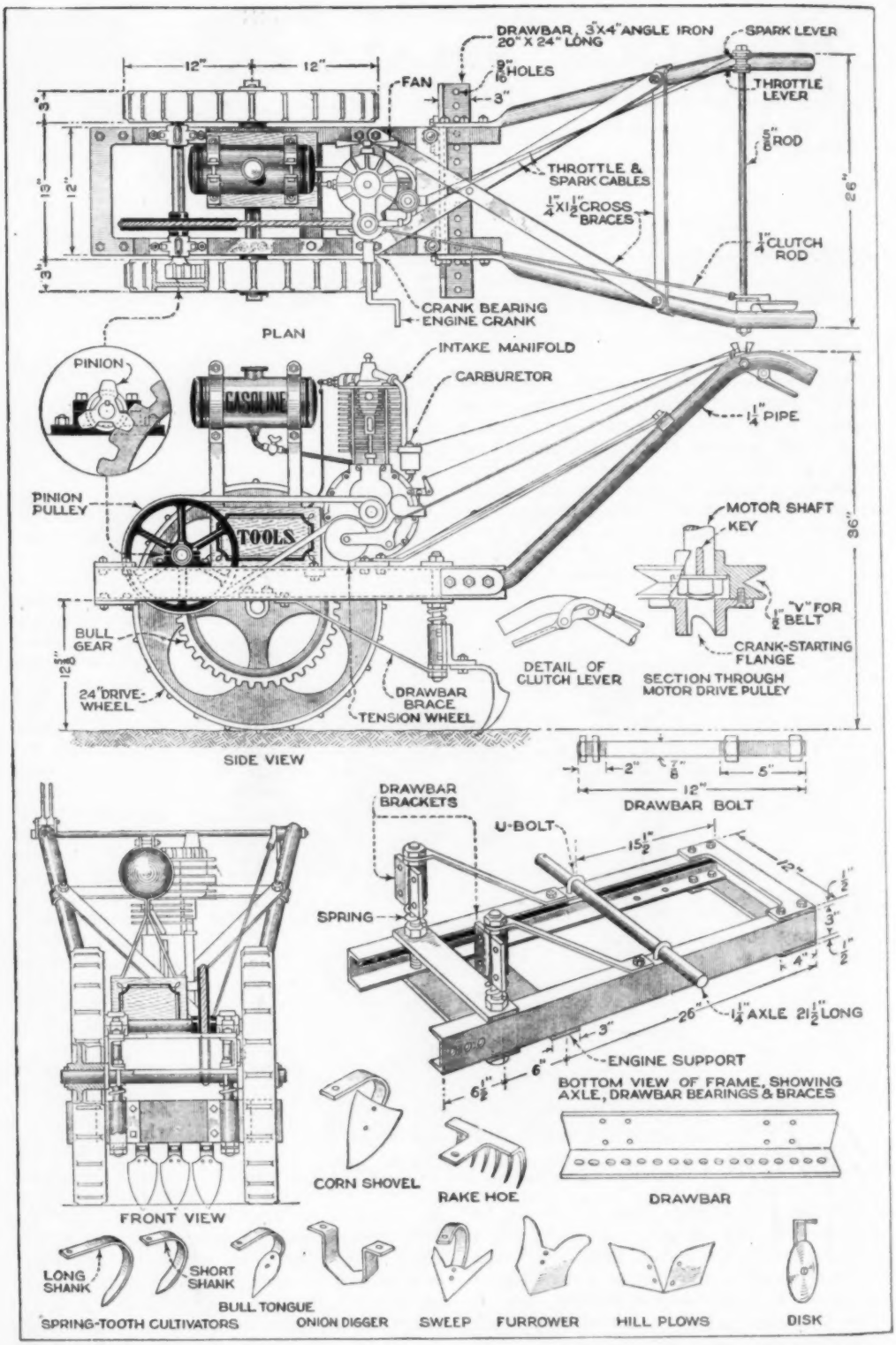
The frame of the larger tractor is made of two 3-in. channel irons, 38½ in. long, with rear cross members of ½ by 3-in. iron or steel plate. The front frame members are made of ½ by 4-in. plate, cut out as shown. Either rivets or bolts may be used in assembling, bolts being perhaps the easier, and just as satisfactory, if used with lock washers. Two bolts should be used on each cross member. All the steel needed for the frame and other parts can be purchased for a few cents a pound from any structural-steel house, which will also do the necessary drilling and cutting, if desired, at a cost of a few dollars.

Front and Rear Views of Small Garden Tractor: This Is a Compact Little Machine That Is Capable of Hard Work

The axle, of 1¼-in. cold-rolled steel, is fastened to the frame by U-bolts. The wheels can be obtained from any farm-implement dealer, and should be of the ribbed-tread type shown. The drive gear should, of course, be cast on the wheel; it should not be less than 6-pitch, to insure its being strong enough for the work. Both wheels run free on the axle, and are held in place with cotter pins and washers, as indicated. They should be provided with grease or oil cups, and must be kept well lubricated. The drive-pinion shaft is journaled in two small pillow blocks, placed forward of the axle; its exact position is governed by the gearing. A little play should be allowed between pinion and gear, when assembling.

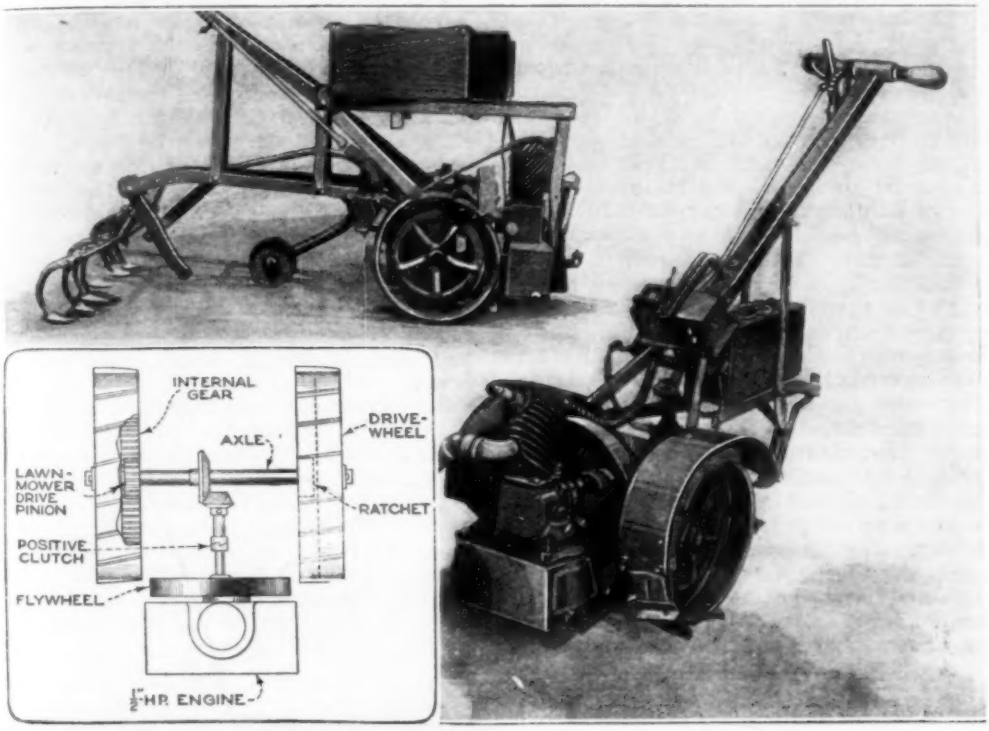
The speed of small garden tractors should be about 2½ miles per hour; this is attained, in the present instance, with an engine speed of 1,200 r.p.m. by using a speed reduction of 21 to 1, and 24-in. drive-wheels. About half of the speed reduction should be made in the gearing, and the remainder in the belt drive from engine to pinion shaft. Pinions of three to six teeth are now available, that function as well as those with 12 or more, and that enable a large reduction to be obtained at one step.

The mounting of the engine is the most important part of the assembly. It is fastened to the cross member nearest



Full Details of the Larger Garden Tractor: This is Powered with a 2½-Horsepower Motorcycle Engine, and is Geared to Travel at the Rate of About 2½ Miles per Hour. The Left-Hand Wheel is Not Shown in the Side View of the Tractor, in Order to Make Clear the Engine and Drive Arrangement

the center, and must be bolted down tightly, and securely braced. An air-cooled, single-cylinder motorcycle engine, of about 2½ hp., running at 1,200 r.p.m., should be selected for the work. A four-bladed fan must be provided, to cool the engine, as the tractor travels so slowly. The fan is mounted opposite the cylinder, pivoted on a bracket bolted to the cross member, so that the pulley will aline with the belt. The short end of the crank is connected to the clutch lever on the left-hand handle by a length of ¼-in. rod, threaded at the upper end, screwed into a link pivoted to the clutch lever, and locked by a nut. When the clutch lever



Upper Left: Side View of Small Tractor, Showing Present Arrangement of Battery Box, and Other Parts. Insert: Outline of Arrangement of Gearing. Right: Close-Up of Tractor, Showing Original Position of Box. The Lever on the Handle Controls the Operation of the Clutch

as indicated, and driven from the crankshaft. The sprocket is removed from the driving side of the crankshaft, and a flat pulley, or the V-grooved pulley shown, substituted. This pulley is recessed for the nut and washer that bind it to the shaft, and the flange for the starting crank is screwed to its outer side. As the starting crank must clear the drivewheel, the exact position of the engine must be determined with the crank in place. An auxiliary bearing, bolted to the frame, supports the crank.

If V-pulleys are fitted, a belt ½ to ⅝ in. in diameter should be used; if flat pulleys, the belt should be 1 in. wide. In either case, an idler pulley, or tension wheel, is used to tighten the belt, and serve the purpose of a clutch; it is mounted on the long arm of a bell crank, cut from steel plate, and the bell crank is depressed, the link passes over the pivot center of the lever, and keeps this position, holding the belt tight until the clutch lever is raised. The proportions of the bell-crank arms, and the position of the link, must be determined by experiment.

The tractor handles are made of 1¼-in. pipe, fastened to the frame, and braced as shown. On the right-hand handle, the spark and throttle controls should be mounted, and connected by wires to the engine.

The drawbar, or tool bar, is of prime importance, as upon its construction and position depend, to a large extent, the efficiency of the tractor, and the ease of its handling.

Two ⅞-in. drawbar bolts are fastened through holes drilled in the webs of the frame, and in the rear cross member.

They are braced by two ¼ by 2-in. straps, as shown. Two ½ by 4-in. steel plates are bent to fit around the bolts, to form the drawbar brackets, and when the drawbar is bolted on, the whole assembly is free to move on the bolts. Short, heavy springs are placed between the upper nuts and the brackets, as shown, and make for easy action on rough or stony ground. The height of the drawbar from the ground is from 5 to 8 in., depending on the tools most used and on the choice of the maker.

The gasoline tank must be mounted high enough to provide a gravity feed to the carburetor; the brackets that hold it may be made of ⅜ by 1¼-in. steel. A box, set under the tank, contains the battery and ignition coil, and may also be used to carry tools, if desired.

Another type of small tractor is shown in the smaller illustrations. The basis of construction, in this case, is a large-sized lawnmower. Extension rims and cleats are riveted to the mower wheels, as shown, to provide traction, and the mower handle, raised to clear the gearing, etc., is used for steering. Power is furnished by a ½-hp. washing-machine engine, and the drive, shown in outline in the insert, is made up of gears taken from a grain binder. The ignition current is furnished by a dry battery, which was originally mounted on a bracket slung under the handle, the ignition coil being carried on another bracket at the bottom of the handle. This was later changed, as shown, and the battery and coils carried on one bracket, mounted above the gearing. A lever, mounted on the end of the handle, controls the operation of the clutch. The method of attaching the tools is shown quite clearly in the various photographs.

Implements for small tractors can be purchased from any dealer or made up, as desired. Old automobile springs, bent to shape, sharpened, and drilled, make excellent spring-tooth cultivators; they should be made in various lengths of shank, so that they can be "staggered" on the drawbar. Shovels, hoes, hillers, etc., can, however, be bought much cheaper than it is possible to make them. Light and shallow plowing can be done in open soil, but in plowing, too much should not be expected of the tractor. The larger tractor weighs from 250 to 300 lb.; if extra weight is desired, boards may be laid on the lower webs of the frame, and the frame filled in with cement. A caster wheel may be fitted to the drawbar, to relieve the arms of weight when running the tractor to and from the garden.

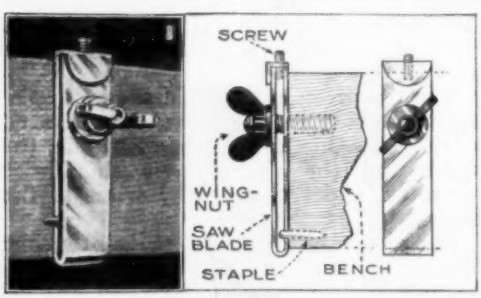
Remember always to use a good grade of oil in the engine, one especially adapted for air-cooled engines, if possible.

Dust, which is the greatest enemy of farm and garden machinery, can be excluded largely by covering the engine and gearing with a sheet-metal hood.

Vise for Holding Small Screws

The illustration shows a practical method of holding small headless screws while slotting or pointing them.

A machine-saw blade is bent to the shape shown, forming a sort of miniature



A Miniature Vise, Made from a Machine-Hacksaw Blade, for Holding Small Screws

vise, the space between the jaws being slightly larger than the diameter of the screw. A small hole is drilled and tapped in the top of the rear jaw to receive the screw. Another hole is drilled through the sides of the jaws to admit a stud that is driven into the bench; a thumbscrew is run on this stud. The lower end of the vise is fastened to the bench by means of a staple. After the screw is inserted in the hole the thumbscrew is turned so that the vise grips the screw tightly.

Coloring Concrete

Mineral colors only should be used for coloring concrete. Other colors are affected by the cement and are therefore not permanent. The coloring matter should be incorporated in the top layer and distributed uniformly throughout the mass. In most cases this is best accomplished by mixing the color with the dry cement, and not with the sand, as the latter is usually wet and causes the coloring matter to lump. The color may also be dissolved in the water before it is added.

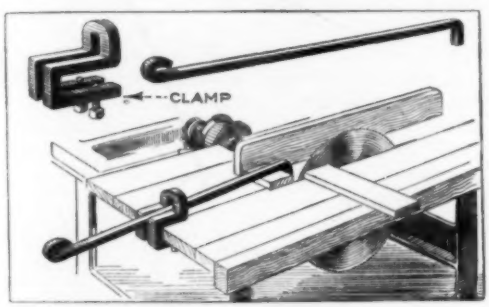
In order to determine the proportion

of color to use in producing a certain shade, a few sample batches should be mixed, with a different amount of color in each batch. These batches should then be allowed to dry thoroughly, as the color of concrete is very different when entirely dry and when just hardened. When the batch having the proper shade of color is found, the proportions used in mixing it must be accurately duplicated every time a quantity is made, so that the work will not appear spotty when finished. No more than 10 lb. of coloring should be used to each bag of cement.

Under no circumstances should dry color be sprinkled on fresh concrete and be troweled down in finishing, as this gives only a thin and uneven film of color, and at the same time makes the surface weak, and likely to dust. Color thus applied soon wears off, and the concrete will present a very spotty appearance.

Finger Guard for Circular Saws

To eliminate the danger of injuring the fingers, when working on a circular saw, a simple guard can be made of ⅝-in.



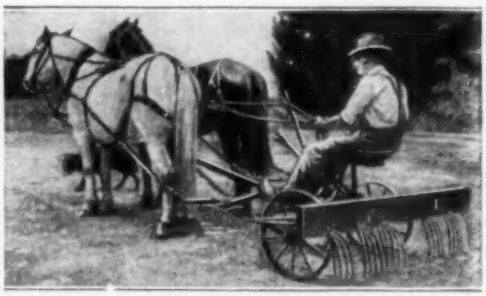
A Simple Safety Device for Protecting the Fingers of the Workman While Using a Circular Saw

square iron or steel. It consists of two pieces: a long bent arm and a clamp or guide. The latter is made so that it can be fastened on the edge of the table.

In operation, the regular work guide, on the top of the table, is set the required distance from the saw, and the clamp holding the arm is attached in a position centrally between the saw and regular work guide. The bent end of the long arm is then dropped over the work so that it will travel along as the piece is being cut. With the fingers of the left hand pressed against the work, between the arm and the guide, there is no possibility of a slip against the saw teeth. The long arm can also be used to draw back the cut stock, left between the guide and saw.

Homemade Implement Breaks Crusted Soil

Heavy rains often leave the surface of the soil so crusted that small grain has

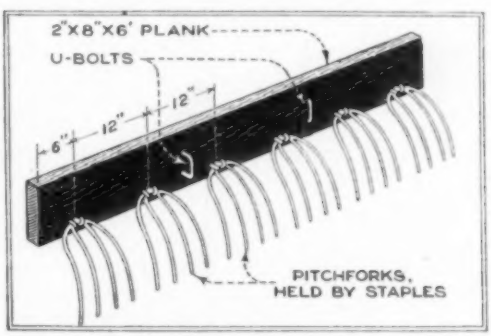


A Homemade Device for Breaking the Surface of Crusted Soil, to Permit Small Plants to Come Up More Easily

difficulty in breaking through. The illustrations show a homemade implement that has been found very effective in breaking up crusted soil over small grain, or grass seed, without any danger of injuring the tiny plants, or of leaving a wide strip of unbroken ground.

The implement is constructed by fastening six pitchforks to a wooden crosspiece, 2 in. by 8 in. by 6 ft. in dimensions. The shanks of the forks are inserted into holes drilled 12 in. apart, and staples are used to hold them securely in position. The device can be attached to a cultivator, or other machine, by means of U-bolts.

The farmer who devised this had a tract of alfalfa, in an irrigated country, that was so crusted at the time the plants were ready to come through, that there seemed no way of saving the crop. By using this simple device, however, the ground was loosened up enough to permit

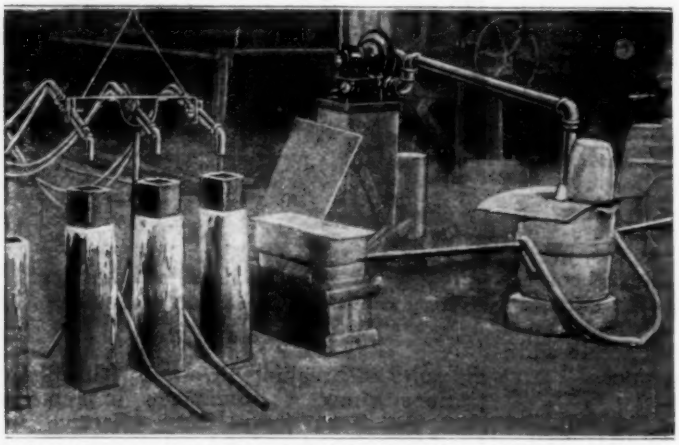


Details of the Soil Crusher: The Device can be Made in Half an Hour

the crop to come through and mature.—Mrs. R. D. Shultis, Grand Junction, Colo.

Heating and Drying Ingot Molds and Ladles

A handy and inexpensive way of drying out the lining of ladles and ingot molds, in which use is made of a ½-hp. motor directly connected to a blower, is shown at the right in the illustration. The air and gas are mixed by the blower, which delivers a blast of flame to the bottom of the molds or ladle. A sheet of metal, with a hole in the top, confines the heat while the fire-clay lining is baking.



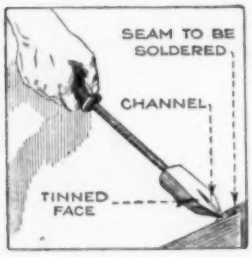
Left: Arrangement of Heaters for Ingot Molds to Reduce Amount of Scrap Cut Off. Right: Air-Gas Blower Used to Dry the Ingot Molds and Ladles

The "pipe" in ingots was greatly reduced in the shop using a device, shown at the left, to heat the metal as it cooled. Previously it had been necessary to crop off about one-third of each ingot as scrap. This reduction in the amount of pipe was accomplished by using the hot top rings shown, and heating the outside and inside of the mold before and after pouring. These top rings are iron castings, 8 in. square and 8 in. long, lined with about 2 in. of molding sand, and baked on top of the electric furnace in which the metal is melted.

The gas burners are arranged in a rack, as shown, so that a blast of flame is directed to the bottom of the molds, until they are as hot as they can be made. At the same time, another set, not shown, is throwing flames against the outside. While the molds are being heated, the ladle is filled and the dross skimmed off. When everything is ready, the upper burners are extinguished, turned out of the way, and the ingots poured. The other burners continue to play against the outside of the molds until the ingots have become comparatively cold, so that the metal will not cool too quickly.

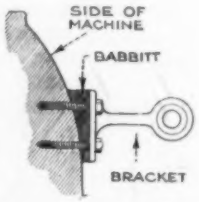
Soldering Vertical Seams

It is difficult and tedious work to solder vertical seams such as found in refrigerator interiors, tank linings, and in roofing work, because the solder has a tendency to run down from the underside of the soldering iron. To overcome this trouble, heat an iron to a dull red, draw it out to the shape shown, and cut a small groove, about 1/16 in. deep, in the upper face. This face only is filed and tinned. Starting at the top of the seam to be soldered, move the iron up and down, applying the solder, which will run through the groove to the point of the iron and into the seam, but not down the untinned sides.



Attaching Brackets to Irregular Surfaces

A machinist in a small shop desired to put an automatic feed on a drill press. In doing so he met with the problem of attaching a bearing bracket firmly to the curved surface of the post, and it was therefore necessary to make a metal base that would fit this surface.



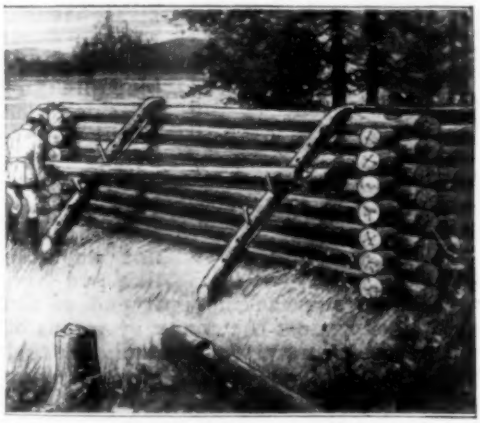
Four holes were drilled in the post, and tapped for studs, which were then screwed in. The bracket was put on the studs and the shaft was put in place so as to bring the bearing into accurate alinement. A clay mold was built around the space between bracket and post and filled with melted babbitt. When cool, this babbitt base was as solid and firm as could be desired.

Mending Tracings

To mend a badly worn tracing, so that the adhesive tape will not come off when the tracing is handled, make a few small holes on each edge of the tear and apply the gummed mending tape on each side. The holes permit the opposite strips of gummed tape to stick together, and as there is more adhesion between the strips of tape than there is between the tape and the tracing, the tape will not come off so easily.—Frank Harazim, New York City.

Handling Logs Easily

In building a log stable on a homestead in Manitoba, Can., a simple method was employed that made it possible for one man to raise the heavy pine logs into place. Two skid logs were set against each wall, the upper ends being flattened to prevent them from rolling. Holes were



Placing the Logs, Used in Constructing a Stable, by Means of Skid Poles, Enabled One Man to Do the Job Alone

bored in these skids, about 18 in. apart, to fit strong wooden pegs. It was then possible to raise the logs, one end at a time, and to keep them in position on the skids by means of the pegs. After a log had been raised to such a height that a man standing on the ground could no longer handle it, another set of pegs were used as footrests in climbing the skids.

Tool for Loosening Nuts

It is a very common practice, and a poor one, to use a hammer and chisel for removing nuts in positions where it is impossible to reach them with a wrench, or impossible to swing a wrench even if it can be placed on the nut. The chisel cuts and mars the edges so that they are very often unfit for further use. By using the simple tool shown in the photograph,

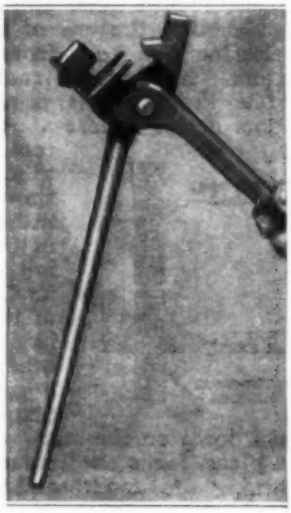
When a Wrench cannot be Used, This Tool Loosens Nuts without Marring the Corners

however, it is possible to remove the nuts without injuring them.

A piece of square stock, of suitable length, is rounded and checkered on one end with a file, and the other end is chamfered. About ½ in. from the checkered end, a hole is drilled and tapped for a setscrew, and the point of the tool is then hardened and tempered. In using it, the checkered edge grips the nut securely, and the setscrew acts as a stop, preventing the tool from slipping. Only a slight mark will be left on the nut as evidence of the use of the tool.

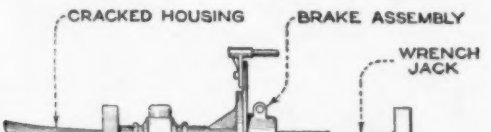
Crimping Tool for Tinners

An excellent crimping tool for tinners can be made from an old pair of tongs, as shown in the illustration. The blocks that crimp the tin are best welded to the tong jaws. The upper lugs serve to give the tin the first bend, then the tin is inserted farther into the jaws, and the second bend given it by the two-pronged lug.



Pressing Off a Cracked Axle Housing

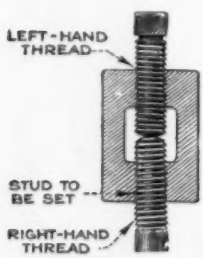
The drawing shows how a cracked axle housing was pressed out of the brake assembly by means of a small wrench jack. The shoulder of the brake assembly was placed against the face of the left-hand angle plate, which had a V-slot cut in it. The jack was set against the other angle plate, and a piece of shafting placed between the jack and the end of the housing. This made it possible to exert a pressure of about 2,500 lb. on the housing, so that one man could do the job easily.—Daniel F. Smith, Jr., Pittsburg, Kan.



A Small Wrench Jack and Two Angle Plates Used to Force a Cracked Axle Housing from the Brake Assembly

Improved Stud Tool

The two most common methods of setting studs are to use a stud tool that has a continuous thread through it, of the same size and hand as the stud, and to use locked nuts. Both of these methods require the use of two wrenches in releasing the tool from the stud, one wrench holding the tool or lower nut, while the other is used to loosen the upper nut or setscrew. An improved stud tool, that saves much time, is made as shown in the illustration. It is recessed in the center; one end is threaded to fit the stud, and a thread of the opposite hand is tapped in the other end, in which a setscrew is fitted. Simply turning the tool down on the stud, with the setscrew in place, locks the tool on the stud. By turning the upper setscrew in the same direction as the stud, the tool is unlocked. Only one wrench is required to lock or unlock it.

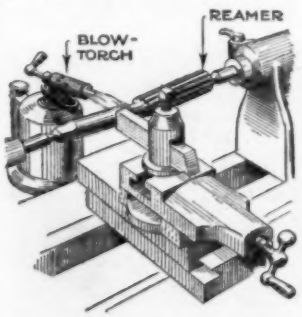


Removing Rear Wheels from Light Car

Rear wheels, that are forced on tapered axles, are often found so tight that a wheel puller will not remove them. It is, however, an easy matter to remove them by raising both rear wheels by means of a jack and starting the motor. When the wheels are revolving at a good speed, the clutch is released and the brake applied. By repeating this a few times the wheel will soon become so loose that it can easily be pulled from the axle.—Albert Chenicek, Chicago, Ill.

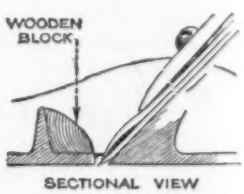
Straightening a Bent Reamer

A bent drill or reamer can be straightened easily without danger of breaking by placing it between the centers of a lathe, as shown. Reverse the regular toolholder and clamp it in the toolpost with the butt toward the tool being straightened. Play the flame of an ordinary blowtorch on the side of the shank opposite the toolholder. When the part is fairly hot, but not anything like red-hot, proceed to squeeze the butt end of the toolholder against the shank by means of the crossfeed screw. Occasionally the tool being straightened is tested to determine when it is straight.



Protecting Plane Bit

After a plane bit is ground and honed, the edge is very often ruined while reinserting it in the plane, if the bit catches on the iron bottom instead of entering in the slot. By fastening a small wooden block between the sides of the plane, as indicated in the illustration, the bit will be properly guided into the slot. The block will not injure the edge should it be struck by the latter. The block is fastened by means of shellac.—M. E. Duggan, Kenosha, Wis.



A Bench Shear for the Small Shop

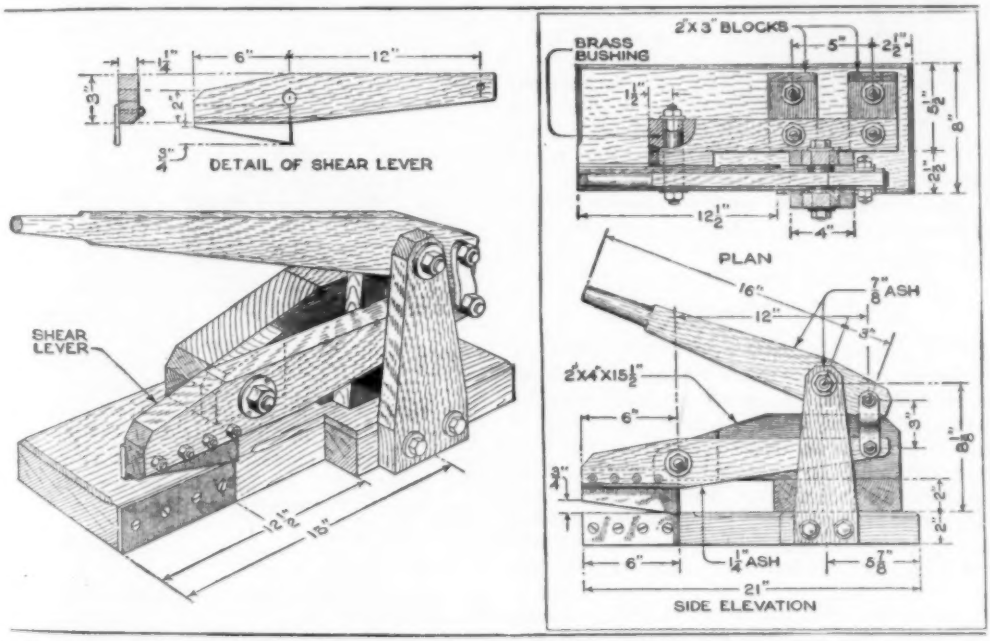
By CLIFFORD A. BUTTERWORTH

THE bench shear described in this article can be made very easily, and will cut much heavier metal than can be cut with a pair of hand shears. It is designed to give a leverage of 30 to 1 on short cuts, and 10 to 1 at the end of a full stroke. As the blade is 6 in. long, and there is a clearance of 6 in. behind it, it is possible to cut metal that is 24 in. wide, by cutting from both sides.

The base is made of 2-in. stock, to the dimensions shown in the drawing. Two blocks, 2 by 3 in., are bolted to it, and the holes drilled for the bolts are countersunk on the underside of the base so that the heads of the bolts will be flush with the surface. Bolted on top of these blocks is a piece of ash, 2 by 4 by 15½ in., and a short piece of ¾-in. hardwood is attached to one end of this block with flat-head wood screws. This ¾-in. piece is faced on the outside with a ⅛-in. steel plate, in which the screw holes are countersunk, so that the screw heads will be flush. The shear lever is attached by means of a ¾-in steel stud passing through these pieces, and it is also faced with a ⅛-in. steel plate where the surface comes in contact with the plate on the ¾-in. block. A brass bushing is pressed into the blocks to serve as a bearing for the stud, which is a tight fit in the shear lever.

The hand lever and its supports are made of ⅞-in. ash. The lever works on a ½-in. bolt, and is also fitted with a bushing. One of the supports is fastened to the 2-in. ash block, while the other is screwed to the base. The links connecting the levers are made of ¼-in. iron or steel. Both the hand lever and the shear lever are fitted with bushings for the link bolts, which are made of ⅜-in. steel.

The shear blades are made of ⅜-in. tool steel, hardened, and the edges ground. The upper blade is 2 in. wide at the front, and 2⅞ in. at the back; it is held to the shear lever by means of bolts, while the lower blade is fastened to the base by flat-head screws, countersunk flush.



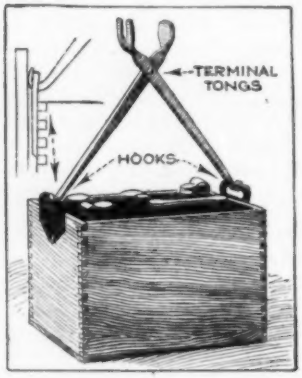
A Bench Shear That will Prove to Be a Very Serviceable Addition to the Equipment of Any Tin Shop: Due to Its Leverage, Much Thicker Metal can be Cut with It than with Any Ordinary Pair of Hand Shears. It is Made of Hardwood, with the Exception of the Links, Bolts, and Blades

Cross-Section Paper Aids in Making Diagrams

Considerable time is wasted by draftsmen in repeatedly picking up and laying aside the scale or dividers, when making wiring diagrams. This can be avoided by placing a sheet of cross-section paper under the tracing on which the diagram is to be drawn, and then scaling the diagram by means of the small squares.

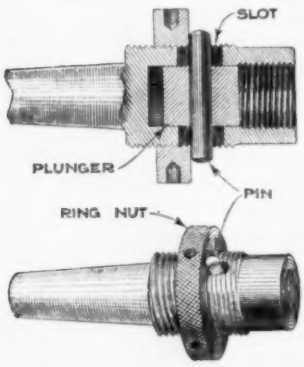
Hooks on Terminal Tongs Lift Battery

The construction of many battery boxes, especially homemade ones, is such that the handles of the battery come below the edges of the box, and so close to the sides that it is almost impossible to remove the battery, without a special tool. A pair of terminal tongs, with the handle ends bent as shown in the illustration, will prove of considerable assistance. The hooks on the ends of the handles make it easy to lift heavy batteries from deep boxes.



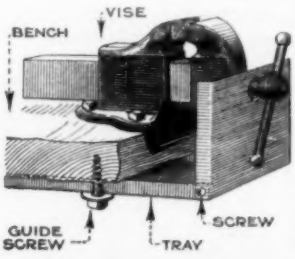
Chuck for Threaded Work

The drawing shows a handy type of lathe chuck to be used when working on threaded parts. It is often necessary to use a threaded chuck, but if the work is held in a chuck of the usual type, it is very difficult to release the work. The application of a pipe wrench may mar the surface, and perhaps spoil the job if a good finish is desired. The chuck illustrated is threaded to suit the work, and the tapping size of the hole continued for about the same distance as the threads. A plunger is turned to a sliding fit in this hole, after which a hole is drilled through the center of the plunger, a drive fit for a pin. The body of the chuck has a slot cut through it as shown, and is threaded outside to fit a knurled ring, which has four "tommy" holes drilled in it. The chuck is operated as follows: The work is screwed in with the fingers, until it is a safe distance in the chuck, when the knurled ring is screwed up; this, bearing on the pin, pushes the plunger up tight against the face of the work. When removing the work, the ring is turned to the left, releasing the pressure of the plunger, so that the work can be unscrewed with the fingers. For light work, the chuck can be made with a taper shank to fit into the lathe spindle, but for heavy work it is best to thread the chuck to fit the spindle nose.



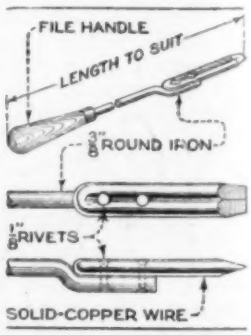
Tray under Vise Catches Small Pieces

When a vise is used for holding small pieces, it frequently happens that the work becomes loose, or slips through the fingers while being removed, and falls to the floor, where it is often lost in a crack. This can be prevented very easily by fitting a tray to the bench so that it extends under the vise, as shown in the drawing. The tray consists of a piece of sheet tin, bent at right angles, and with the sides turned up and fastened at the corners with small screws. A hole cut in the front fits over the vise screw, and the bottom of the tray slides underneath the bench between two lagscrews fitted with washers.



Small Soldering Bit Easily Made

A small soldering bit of the type illustrated can be made in a few minutes from a short length of ⅜-in. iron rod, some No. 6 copper wire, two small rivets, and a wooden file handle. The copper wire is doubled, sharpened to form the bit nose, and attached to the iron rod with the rivets; the rod is then driven into the handle. This bit has proved to be especially handy in soldering open circuits on small coils and rheostats.—G. C. Madison, West Haven, Conn.



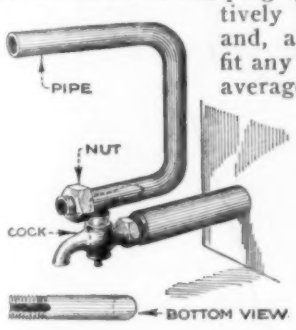
Gummed Business Cards

Business cards of machine repairmen are very often mislaid or lost, and this means that one must go to considerable trouble if the services of the same man are again desired. For this reason, the repairman will find it an excellent idea to use gummed small stickers, on which his name and address are printed, together with other advertising or recording data, as he may wish.

These stickers are made of a thin grade of tough paper, well covered with strong adhesive, so that they will stick for a long time. They should be pasted in a conspicuous place on the machine or fitting, where they may be accessible for constant reference, and at the same time present a neat appearance.

Grinder for Plug Cocks

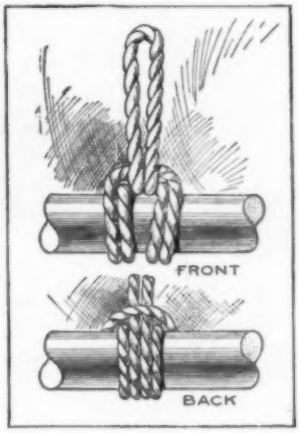
The lever shown in the drawing makes the work of repairing leaky gas, water, or air cocks of the plug type a comparatively simple matter, and, as the tool will fit any valve handle of average size, is worth making where jobs of this kind must be done from time to time. The lever is made of a piece of pipe, bent to the shape shown, although, if preferred, it can be built up of nipples and elbows. In any case, the bottom end is threaded and a slot cut in it, so that, when the lever is slipped over the handle, it will be held upright; a nut screwed onto the threaded end prevents the tool from sliding off in use.



The correct way to repair a defective cock of this type is to apply a little grinding compound, at first only where the bearing marks or rings show and not over the whole length of the plug as is often done. The plug is rotated in semicircles by a back-and-forth movement of the handle. Using the lever shown, a good purchase is obtained and greater pressure applied to the plug than by using the valve handle alone, as the more pressure that can be applied, the quicker the plug can be made tight. When the bearing marks begin to show over the whole surface of the cock, the paste may be applied to the entire length.

Safe Sling for Heavy Bars

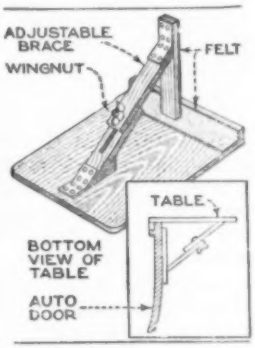
When handling heavy and slippery round bars with a crane, it is customary to pass the end of the sling around the bar once and then through the loop at the other end. This method is not a safe one, and it occasionally happens that an unbalanced bar slips out of the hitch. The illustration shows the front and rear views of a hitch that is safe, and at the same time self-tightening. The end of the sling is passed twice around the bar, instead of once, before being passed through the loop.—A. J. Denner, Brooklyn, N. Y.



Auto Tables Please Store Patrons

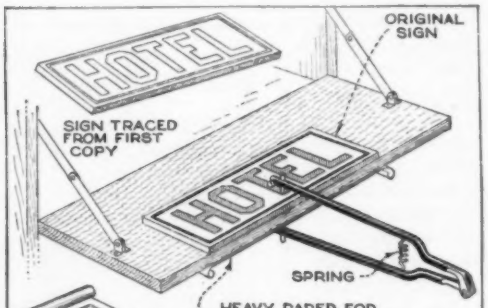
Stores catering to the trade of automobile parties can add greatly to the convenience of their customers by using small serving tables of the type illustrated, which can be made at very little expense.

The tables slip over the edges of the automobile doors, and can be put in place instantly. Each one is fitted with an adjustable brace consisting of two pieces. One piece is securely fastened to the underside of the table and has a slot cut lengthwise in it. The other piece has a hole drilled near the end. The pieces slide one upon the other, and are clamped together by a bolt and a wingnut. A strip of wood is attached to the end of the brace, and another strip nailed to the edge of the table, as shown. Felt, glued to the wood as indicated, is used to prevent the table from scratching the varnished surface of the car doors.—Tom Freeman, Beaumont, Tex.



Reversing or Duplicating Tool

The interesting tool shown in the drawing was discovered in the shop of a sign



A Simple Tool That will Prove of Value to Sign Painters for Reversing or Duplicating Designs

painter, where it was used for making duplicate posters. Its uses are many; it will copy a picture, or transfer a drawing or design to the opposite "hand" without requiring any skill on the part of the person using it, so that a boy can do some work that ordinarily would require the time of a highly paid sign artist.

The tool consists simply of two rods, jointed as shown, drilled and slotted for a pencil and tracing point, and fitted with a spring. A buggy-top hinge would make a good tool of this kind.

As shown in the drawing, the original design is tacked to the top of a shelf, and a sheet of heavy tracing cloth, or paper, underneath. The design is then traced with the rounded point, producing a reversed copy on the paper underneath. If a duplicate of the original is required, the reverse is used, in the same manner, on top of the shelf.

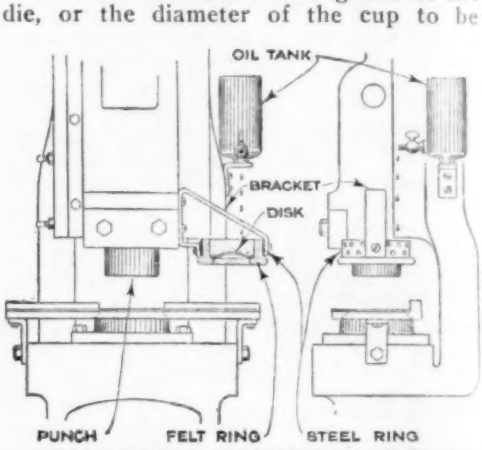
The tracing point and the pencil should be exactly opposite each other, and be clamped tightly, as indicated, by means of round-head screws.

Preventing Tools from Rusting

Tools of all kinds soon become rusty when exposed continually to a damp atmosphere, or when used only occasionally. To prevent this, keep the tools in a box filled with oil-soaked sawdust. Oil that is drained from the crankcase of an automobile, and that is to be thrown away, will serve very well for this purpose. Sand may be substituted for the sawdust, in a box where shovels, spades, and similar large tools are kept. The sand will also serve as a scouring agent that will prove of great help in removing the rust already on the tools.

Stock-Oiling Device for Punch Presses

The drawing shows a method of oiling tin, or other metal, in sheet form, that is being formed or drawn on the punch press. An oil tank, similar to those used on milling machines, is supported on a bracket attached to one side of the punch-press frame. A steel ring is fastened to the side of the ram by a bracket, and a felt ring, a little larger in diameter on the outside than the blanking size of the die, or the diameter of the cup to be



An Oiling Device for the Punching and Drawing Press, That Automatically Applies a Thin Film of Lubricant to the Face of the Stock at Each Downward Movement of the Ram

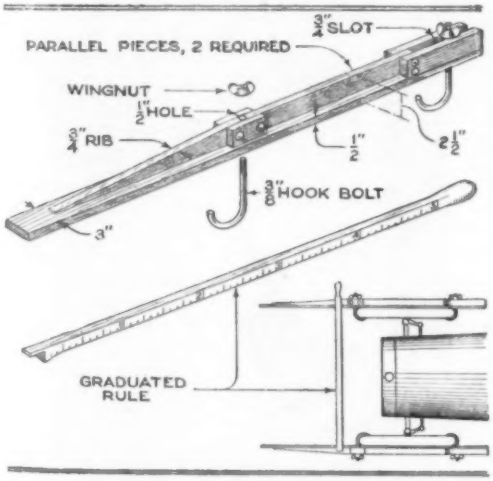
drawn, is forced into this ring, as shown. The felt ring is so located in relation to the punch that when the ram is in a "down" position, the pad will oil the stock as it rests on the platen, just where the punch will come on a later stroke. The oil drip is so arranged that the oil drops on a spring disk inside the felt pad, and the oil flow is regulated so that only a very light film of oil is left on the tin where it is needed in the drawing or blanking operation. This method, besides being economical in the amount of oil used, does away with the necessity of oiling as a separate operation, and on lithographed work, on which the lithographing tends to soften and scratch when left with a heavy coating of oil for a few hours, it is especially advantageous.

Alining Automobile Wheels

Alining the front wheels of an automobile alone is quite a job, and where work of this character is of frequent occurrence, as in the one-man garage, the alining device shown in the drawing will speedily prove its value.

Two pieces of ¾-in. lumber, 3 in. wide and 8 or 9 ft. long, are planed true and fitted with ribs, glued and screwed to one side. The ribs are cut off and beveled, as shown, at the front ends of the "parallels," and cut off short about 1 ft. from the rear end. Two ¾-in. pieces are then bolted to each rib and screwed to the parallel at the rear end, as shown. This forms a ¾-in. slot, which is also cut through the bottom pieces, for the rear hook bolt. The front hook is inserted through a hole drilled a little forward of the center of the parallel, the rib being strengthened at this point. The bolts are made of ⅜-in. iron or steel rod, threaded on the upper end for wingnuts.

To use the device, the hooks are placed over the tire and rim on each wheel in such a manner that the straight edges are horizontal, then tightened. Then, by sighting over the projecting portions, they are made parallel. After making sure that both wheels are pointing straight ahead, the distance between the parallels is measured, close to the tires, as shown, then at the outer end of the parallels, and the two measurements are

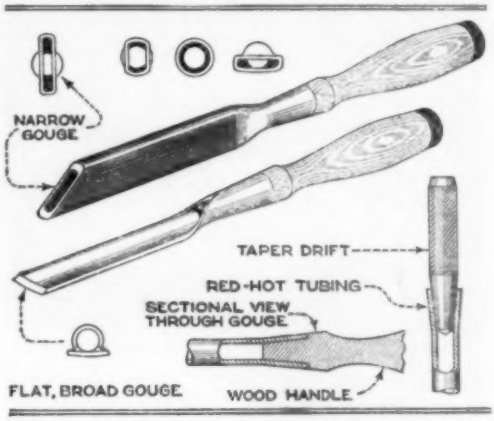


Truing Up the Front Wheels of an Automobile Is Not Usually a One-Man Job, but the Device Illustrated Above Makes It So

compared. The front wheels should "toe in" slightly, not less than ¼ in. nor more than ⅜ inch.

Making Gouges of Steel Tubing

Gouges are tools that all woodworkers must use at times, but usually not often enough to necessitate the purchase of a



Steel Tubing, Used to Make Woodworkers' Gouges of Various Shapes and Sizes, and of Excellent Quality

complete set. Gouges made of seamless steel tubing, however, will answer excellently for the occasional user.

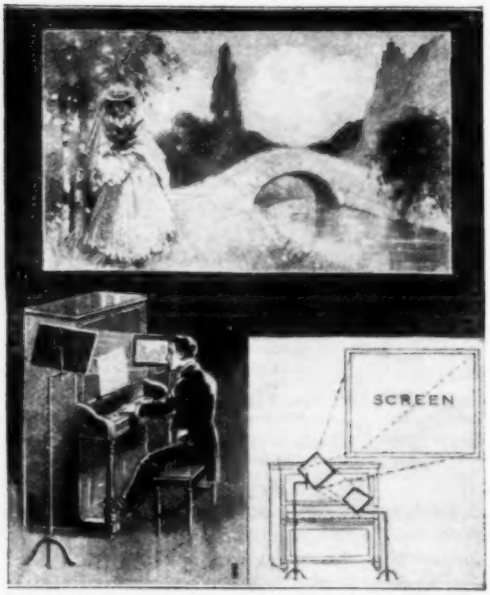
They are made from pieces of fairly heavy-gauge tubing, flared open at one end to receive a wooden handle. This is done by heating the tube until red and then driving a taper drift into it to expand it. For narrow gouges, the tubing is flattened as indicated, and beveled on the end to form the cutting edge. A medium-flat gouge can be made by flattening out the tubing a little less. By slitting the tube and spreading it open and almost flat, a broad gouge is formed.

To make the steel hold an edge, it is well to caseharden it slightly, which is done by dipping the red-hot steel in powdered cyanide of potassium and quenching in cold water. As these tools are always ground on their forward faces, the casehardening will not be ground away from the lower part of the cutting edge. In some cases it will be found that, if the tools are tempered after hardening, a better and longer-lasting edge will result. To those unaccustomed to using cyanide, a word of warning is necessary. Do not inhale the fumes, as cyanide of potassium is an active poison.

¶ When scraping carbon from automobile pistons, and from the face of the cylinder block, use short headless setscrews to keep the particles of carbon out of the cylinder-head bolt holes. This method is easy and quick.

Reflector Aids Motion-Picture Pianist

It is often a great strain for the organist or pianist in a moving-picture theater to glance up continually at the picture



This Arrangement of Two Adjustable Mirrors Enables the Moving-Picture Theater Pianist to Follow the Picture without Turning His Head

while playing, in order to make the music correspond to the action.

This trouble can be overcome very easily by using two adjustable mirrors, mounted on portable stands, as shown in the photograph. One of these mirrors is set at such an angle as to catch the picture on the screen and reflect it into the second mirror, which is placed close to the music rack, and in front of the musician.—H. F. Hess, Des Moines, Ia.

Action of Radio Switches Improved by Vaseline

While in a laboratory where radio-resistance measurements of great importance were being conducted, a visitor was much surprised to see one of the assistants apply a generous amount of vaseline to the points and blades of a rotary, or dial, switch. The action was slightly squeaky, and the lubricant was applied to overcome the scratchy effect and make the instrument operate smoothly and with good electrical contact. It was explained, that, paradoxical as it may seem, the use of vaseline on such switches had been found to improve not only the mechanical action but the constancy of the contact as well. This was discovered in an investigation where it was necessary to have a commutator operated with extraordinary definiteness and efficiency. Everything had failed until the worker drenched the part with oil. Much to his surprise, the experimenter found that this produced exactly the effect he sought. Since that time vaseline has been found to be equally effective, and cleaner and easier to apply than oil.

Making Center Testers Magnify Errors

A simple method of greatly magnifying the slightest movement at the point of a center-tester needle is to use a strong feather quill, about 1 ft. long, pressed on the end of the needle. The quill is very light and will not cause the needle to vibrate, which would be the case if an additional length of steel or even aluminum were used.—L. M. Steffen, Dayton, Ohio.

Rolling Oxygen Cylinders

Heavy oxygen cylinders are generally moved for short distances by tipping them slightly and rolling them on the edge in the same way as barrels. But owing to the small diameter, the height, and the weight of these cylinders, it is not an easy matter to roll them in this way. For this reason, the device shown in the drawing was made. It consists of a hardwood wheel, 6 or 7 in. larger in diameter than the cylinder, and fitting nicely over the bottom of the latter. A rope, knotted at the end, is passed through a hole drilled about halfway between the inner and outer edges of the wheel. After the rope is wound once or twice around the cylinder, it is caught in a tapered slot cut opposite the hole. By rolling the cylinder on the wheel in the direction opposite to that in which the rope is wound, the latter is tightened instantly. It can again be loosened by giving the wheel a slight twist in the same direction as the rope is wound.

Amateur Mechanics
Information as to where to obtain any specified materials or parts for making objects described in the following pages may be had, on request, from our Bureau of Information.—Editor.

A Roller Coaster for Skaters

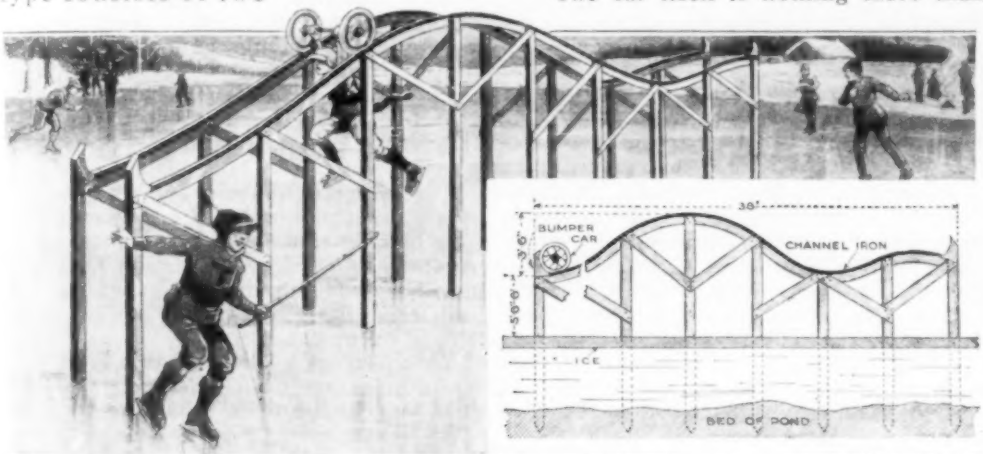
By DALE R. VAN HORN

THE ice coaster shown in the illustration will provide much exhilarating sport for skaters. Erected on smooth ice, it awaits the speeding skater, who shoots into one end, grasps the axle of the "car" and, after sweeping over the curves of the track, alights at the other end and speeds on.

The main frame of any coaster of this type consists of two rows of 4 by 4-in. posts, driven into the bottom of the pond or river through holes cut in the ice. When the ice again forms around the posts, they are quite rigid; they are set 6 ft. apart, and the track is 3 ft. wide. The pattern of the track curves is laid out on cardboard, in sections, and used to cut the 2 by 6-in. track timbers to shape. These timbers are nailed to the inside of the posts, and the posts are braced as shown. The track proper is made of light channel iron, bent to fit the 2 by 6-in. timbers, and spiked to them.

The dimensions of the coaster, as shown in the illustration, need not be rigidly adhered to. The height, length, etc., will depend entirely on the space available, and upon whether adults or youngsters are to use the device. The drawing is intended only to serve as a general guide. The track should not end at the bottom of an incline but should run parallel to the ice—or nearly so—for some distance, so that the skater may balance himself on the ice, and let go the car before it strikes the bumper.

The car itself is nothing more than the axle and wheels of a tricycle, or baby buggy, preferably a ball-bearing one for easy running.



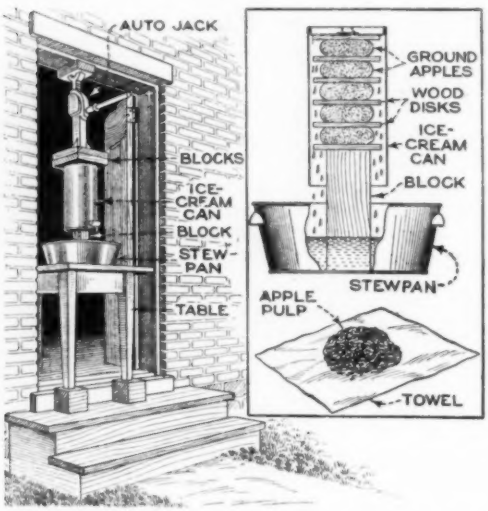
A Simple Coaster, Made of a Few Pieces of Lumber and Some Channel Iron, and Provided with a "Car" Made of a Tricycle or Buggy Axle, Furnishes Exhilarating Sport for the Skating Pond. The Drawing Serves Only as a Guide, the Dimensions being Altered to Suit the Location or the Users' Convenience

Creeper for Painters

When painting or varnishing floors and baseboards, I find a creeper of considerable assistance. It is made from a strong wooden box, about 1 ft. square and 15 in. high. A ball-bearing caster is mounted at each corner. This box is used as a seat and makes the work much easier. While working on doors and windows, the box can be placed on one side, and the paint or varnish set on it, so as to save one from stooping constantly to fill the brush. —C. O. Soots, North Salem, Ind.

Improvised Cider Press

A simple but quite effective cider press was improvised from common equipment available about the house. It consisted



A Simple Cider Press That can be Improvised from Materials Found around the Average Household, or Easily Obtainable

of a stewpan, an ice-cream can, an auto jack, and a few pieces of wood and toweling, arranged as shown in the drawing.

The apples were first quartered, and, after the bad spots were removed, ground with a small food chopper, using the coarsest plate. The pressing of the juice was then accomplished by wrapping the apple mash in pieces of old towels, a quart of mash being placed in each piece of towel. These sacks of mash were placed in the ice-cream can to within ¾ in. of the top, and were separated from each other by wooden disks, a little smaller in diameter than the inside of the can. The can, with its contents, was then inverted and placed over a wooden block about 5 in. in diameter and 12 in. high, and the whole assembly set in a stewpan. By placing this arrangement on a small kitchen table in a doorway, and using an auto jack, as shown, to apply the pressure, the cider was squeezed out of the mash in a very short time.

In using this method, it might be thought that time and trouble could be saved by placing the mash in one large sack. This is not so, however; the cider cannot be squeezed out of such a bulk. By placing the batches between wooden disks as described, nearly all of the juice will be extracted. This method has proved to be quite practical.

Increasing Furnace Efficiency

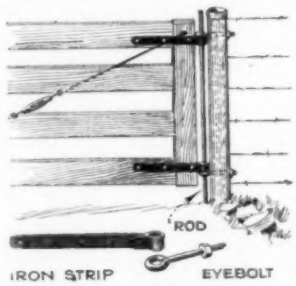
The owner of a newly installed furnace experienced great difficulty in keeping the temperature at a point where the occupants of the house would be comfortable. After exhausting all other means, it was suggested that a blower be placed in the cold-air duct. This was done and no further trouble has been experienced.

A damper was placed in the cold-air duct to regulate the amount of cold air entering the furnace from outside, most of the cold air in moderate weather, and all of it in severe weather, being drawn through the cold-air register on the first floor. The cold-air duct is, of course, made so that the air can be drawn either from the outside of the house or from the register inside. The fan or blower was placed inside the duct about 2 ft. away from the furnace, and controlled by a switch upstairs. As a result of this change, the house is always maintained at a comfortable temperature, and many dollars have been saved in coal.—A. J. Spengler, Chicago, Ill.

A Practical Gate Hinge

Considerable difficulty is often experienced in attaching a gate to steel posts, in a manner that is rigid and substantial. A simple hinge was devised on our farm that has been found entirely satisfactory, and that has several advantages over hinges on the market.

To construct a hinge of this type, two ½-in. holes are drilled through the steel post, one about 6 in. from the top, the other 8 in. from the bottom. Eyebolts, with eyes ¾ in. in diameter, are fastened through these holes. Two pieces of flat iron, about ⅜ in. thick, are bent as shown and three holes drilled in each for small bolts. These strips are then bolted to the gate so that after the gate has been raised in position, they will fit between the two eyebolts, as shown. A ¾-in. pipe or rod is used for a hinge pin, and the gate will then swing freely either way.



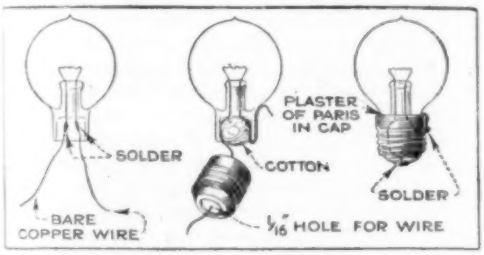
This arrangement holds the gate firmly above the ground, while making it impossible for hogs to raise it off the hinge pin,

due to the position of the upper eyebolt. In winter months, the gate can be raised a few inches to clear the snow, by putting the upper hinge on top of the eyebolt.—J. R. Kuntz, Bremen, Ind.

Repairing Electric Lamps

It was found, in one garage, that a greater percentage of electric lamps was lost due to the loosening of the brass screw cap from the glass, than to the breaking of the glass or the burning out of the filament. When the cap became loose, the bulb would twist around, and this might cause the terminal wires to cross and blow out a fuse.

It was found possible to repair a number of these bulbs in the following way: Take two pieces of No. 20 bare copper wire, about 3 in. long, and solder these to the lamp terminals, to facilitate assembling, as shown. Push a piece of cotton wadding into the glass stem to prevent the wires from coming in contact

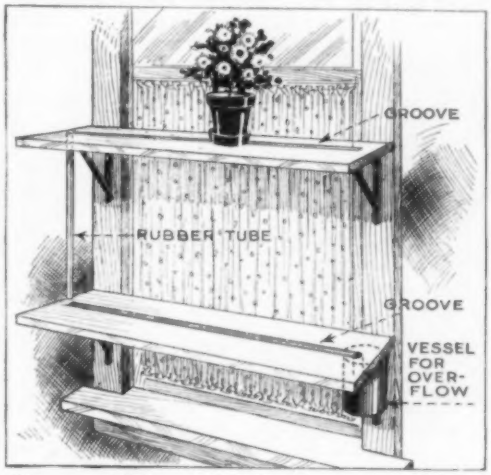


A Simple Method of Repairing Electric Lamps When the Brass Screw Caps Are Loose

with each other. Drill a 1/16-in. hole in the brass cap and draw one of the wires through this hole. Bend the other wire over the edge of the glass. Fill the cap with plaster of Paris and press the bulb in place, taking care to keep the wires taut. Then solder the ends of the wires to the cap, to assure a perfect connection. Globes repaired in this way will last just as long as new ones.—E. J. Bachman, Fullerton, Pa.

Drained Shelves for Flowerpots

Drained shelves, as shown in the illustration, are very practical for use with common flowerpots. A groove is cut in each shelf, the groove being made to slope toward a hole drilled in one end, and the shelf itself tilted a little in the same direction. Cemented into this hole is a rubber tube, leading to a groove cut in the shelf below, or to a receptacle. If two shelves are used, as shown, the receptacle is placed under the lower shelf. Each flowerpot is placed on the shelf so that the small drain hole in the bottom

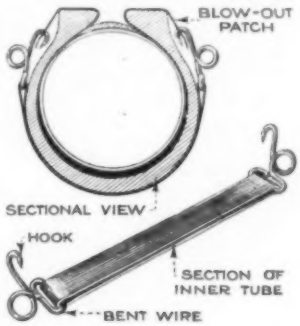


Flowerpot Shelves Provided with Drains, Make It Unnecessary to Remove the Pots When Watering, or to Have Dishes for the Pots

of the pot will be exactly over the groove. By using shelves of this kind, it is possible to prevent the troublesome overflow that ruins the varnished surface of the window sill and casings, and spatters the curtain and window. The shelves, of course, should be painted or shellacked, to prevent the water from soaking into them.—T. R. Hart, Ashtabula, Ohio.

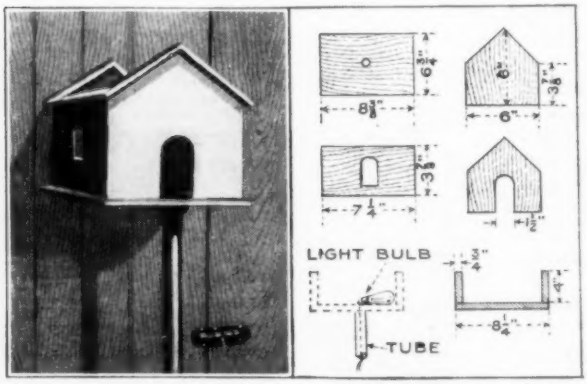
Holding Blow-Out Patch While Replacing the Tire

The difficulty of keeping the edges of a blow-out patch outside the casing while a tire is being replaced on its rim is avoided when the holder shown in the drawing is used. This little device consists of a band, ½ in. wide, cut from an old tube, and fitted with two sharp-pointed wire hooks. After inserting the patch, the hooks on the holder are pushed through its protruding edges, and the rubber band prevents the ends from catching under the rim while the tire is being applied.—G. A. Luers, Washington, District of Columbia.



Novel Lighting Fixture for Porch

As a porch lighting fixture of the common ceiling type proved unsatisfactory, because it gave a glaring light, two fixtures of the indirect type were made by a householder, and placed on each side of the porch, so as to provide a balanced illumination.



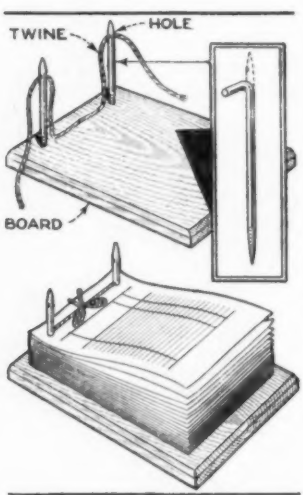
Two of These "Bird Houses" were Used as Indirect-Lighting Fixtures on a Porch, to Provide a Soft Light

Each of these was made of ¾-in. wood, and constructed, as shown in the illustration, to resemble a bird house. A window was cut in each side and a door in front; orange-colored glass was inserted behind these openings and held in place with putty. The standards used as supports for the "bird houses" were made from lengths of tin piping, and the wires run through them. The lower end of each standard was firmly tamped into the soil in a large flowerpot, as a heavy base was necessary to keep the fixture from being overturned easily. When completed, the whole was given three coats of enamel, inside and outside. Various colors were used on the outside; a bright red on the roof edge, white on the ends and sides, and bright green on the base edge and on the edges of the door and windows. A 10-watt frosted lamp was used in each fixture.

When making a fixture of this type, it may be impossible to obtain colored glass for the doors and windows. In that case colored tissue paper can be used; it is pasted on the inside and shellacked. A strip of asbestos should be glued under the bulb to avoid charring the enamel.

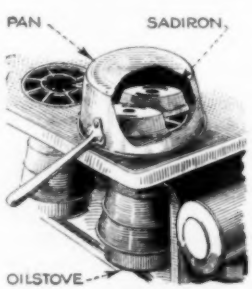
File Board Facilitates Binding of Papers

A simple board, used for filing letters, bills, and similar matter, can easily be arranged so as to assist in binding this material after the file has been filled. A hardwood board of the required size is fitted with two steel prongs. These are made from screw-hooks, straightened and ground to a point at the ends, as shown, and with small holes drilled near these ends. A piece of twine is passed through the holes, enough slack being provided between the prongs to permit the papers to be pushed down firmly upon the board. When the file is full, the ends of the string are pulled out of the prongs and tied. The papers can then be lifted off. This method of binding the papers while they are held in place on the file board does away with the slow and tedious work of stringing them singly.



Heating Sadirons Quickly

Considerable trouble was experienced in making sadirons sufficiently hot on an oilstove. After experimenting with several methods, none of which proved successful, a large stewpan was placed over two irons while they were being heated. Most of the heat was now confined about the irons, and consequently they soon became hot. Food can be prepared much more quickly by applying the same idea, which means a considerable saving in fuel.—Mrs. J. V. Romig, Allentown, Pa.



A Homemade Xylophone

By VERNON W. PALEN

AN excellent xylophone can be made at home, by anyone who can handle simple tools. The volume of tone is not so great as in commercial instruments, as the homemade one is not equipped with resonators, but the quality of the tone is excellent, and, as the commercial one costs about $50, and the homemade one about $6.50, one can dispense with volume.

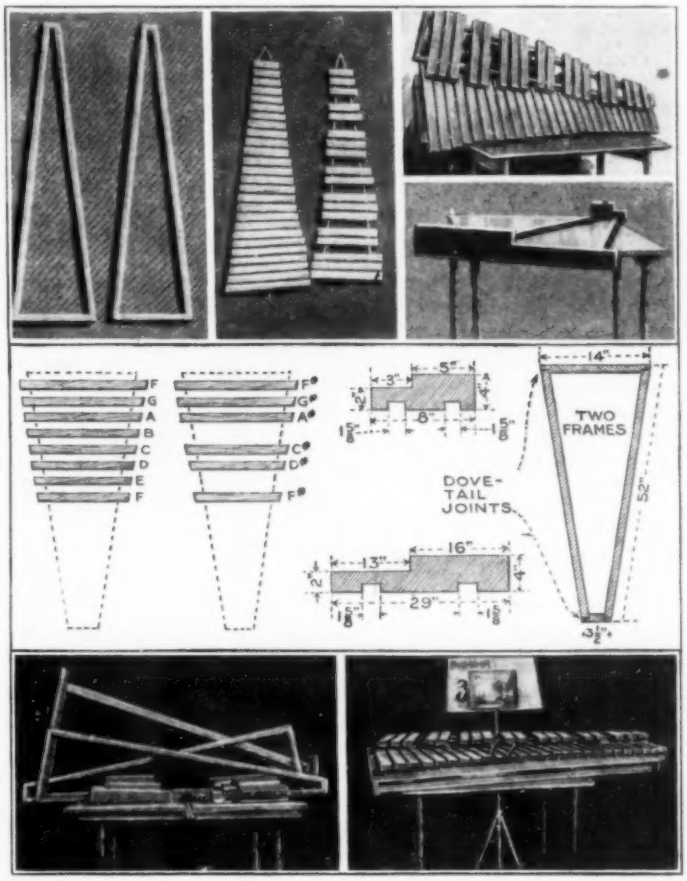
Oak is used throughout in the construction of the instrument, and it is best to purchase this from a planing mill, dressed to size. The bars, bar frames, and braces of the main stand are of 15/16 by 1 5/8-in. stock, and the endpieces of the stand are 3/4 by 4 in. in dimensions, one piece being 8 in., and the other 29 in. long.

The first step is to construct the two triangular bar frames, the sides of which are 52 in. long; one endpiece is 14 in. and the other 3 1/2 in. long. The joints should be dovetailed, or half-lapped, glued, and screwed. The upper edges are faced with xylophone felt, glued on; this can be obtained at any large music store.

The bars cover 3 1/2 octaves, and are cut to the lengths given in the appended table. Most of the work in constructing the xylophone lies in the tuning of the bars, for, even though they are cut exactly to the lengths specified, they will, in most cases, be out of tune, as some parts of the wood are denser than others, and the bars must therefore be tuned separately.

Two methods may be used in tuning the bars. The middle-C bar may be tuned to the corresponding note on a piano, and the remainder of the bars tuned from it, or each bar may be tuned to its corresponding piano note. I used the first method, as I did not wish to litter up the room with sawdust and shavings; this method, however, demands a good ear.

To lower the pitch of a bar, it is hollowed out on the underside with a drawshave, while held in a vise. To raise the pitch, a little is sawed off the end of the bar. Experiment will teach the constructor just about how much to remove in either case. The bars should be laid



Upper Left: Triangular Bar Frames. Upper Center: The Finished Bars. Upper Right: Bars and Stand. Center: Details of Construction. Lower Left: Instrument Knocked Down. Lower Right: Xylophone Complete

in the approximately correct position on the frame, and struck with the mallet, to sound the note for tuning.

After tuning, the bars are drilled, about 2 in. from each end, for a heavy cord, and then sandpapered to a fine finish, stained, and varnished.

All the natural bars are strung together, on one pair of cords, a 1/4-in. piece of rubber tubing being slipped over the cord between adjacent bars. The sharp and flat bars are strung on their cords in groups of two and three, pieces of tubing 5/8 in. long being used between bars, and

pieces 2 in. long between groups. The bars are then laid on the frame, and the cords fastened tightly to screweyes in the ends of the frame.

The instrument proper is now finished, but in order to raise the sharps and flats above the naturals, a stand is made, using the pieces of 4-in. stock and two lengths of the 1⅝-in. stuff. The endpieces of the stand are stepped, and the braces set into grooves cut in the underside.

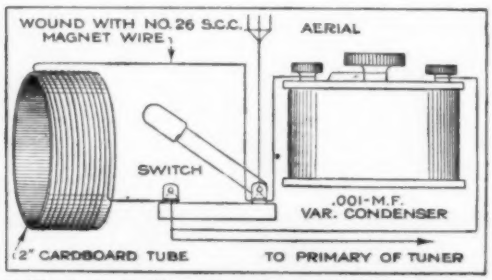
If xylophone felt, which is ¼ in. thick, cannot be obtained readily, a soft ¼-in. rope can be used on the frames instead.

LENGTHS OF BARS IN INCHES

F	18⅛	G	13⅜	A	9½		
F sharp	17¾	G sharp	13⅛	A sharp	9¼		
G	17⅝	A	13	B	9		
G sharp	17¼	A sharp	12¾	C	8½		
A	17	B	12½	C sharp	8¼		
A sharp	16¾	C	12	D	8		
B	16⅜	C sharp	11¾	D sharp	7⅞		
C	15⅞	D	11½	E	7½		
C sharp	15½	D sharp	11⅛	F	7⅛		
D	15¼	E	11	F sharp	7		
D sharp	15	F	10½	G	6⅞		
E	14⅝	F sharp	10¼	G sharp	6⅝		
F	14	G	10	A	6⅜		
F sharp	13¾	G sharp	9¾	A sharp	6⅛		
B	5⅞	C	5½				

Radio-Wave Trap

In large cities, when different stations are broadcasting at the same time, much interference is caused in the reception of



A Simple Radio-Wave Trap That will Eliminate Much Interference When Tuning the Radio-Receiving Set

the waves. This can be prevented, to some extent, by a wave trap. This consists of a large variable condenser, a coil of wire, and a small switch, connected as shown in the diagram. A 43-plate variable condenser with a capacity of .001 mf. is suitable.

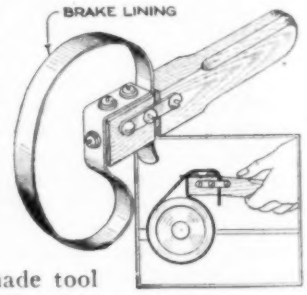
The number of turns of wire wound on the cardboard tube depends on the length of the wave to be eliminated; for instance, if it is desired to eliminate a 200-meter wave in tuning to 360 meters, from 30 to 40 turns are necessary, and more turns, in proportion, for greater wave lengths. It is a good idea to use a common adjustable tuning coil for this purpose. Honeycomb coils can also be used if desired. To eliminate interference, the condenser is adjusted until the undesired wave is no longer heard, and the receiving set can then be tuned to maximum signal strength.

A Simple Bookmark

The corners of a sealed envelope, cut off in the shape of triangles, serve excellently as bookmarks. They will fit over the corners of the pages, and are free from an objectionable feature of most bookmarks, as they do not cover up any of the printed matter.—A. W. Michener, New York City.

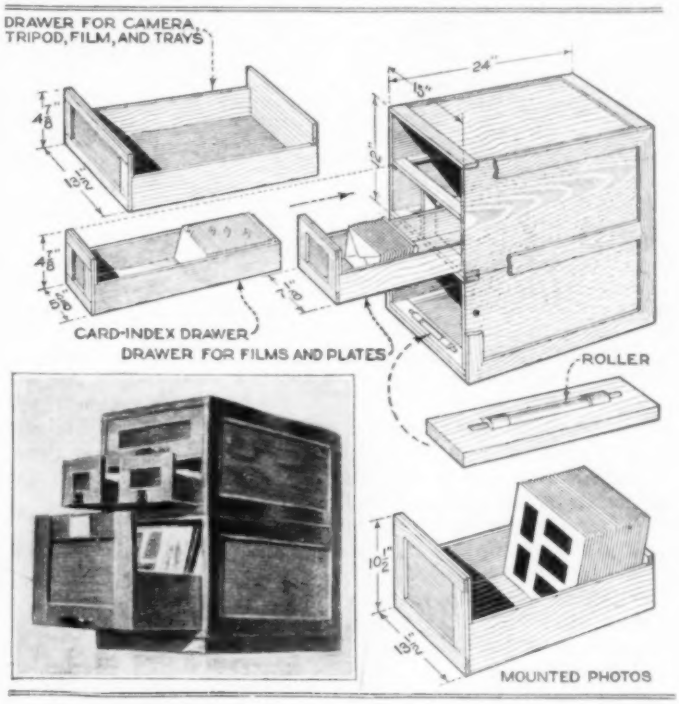
Wrench for Headlamp Rims

Considerable force is required to turn the rim of an automobile headlight when it has become rusted, and by force improperly applied or with improper tools, considerable damage may be done to the lamp. The drawing shows a convenient homemade tool that will remove any sticking headlamp rim without damage. A strip of brake lining is attached to one end of the two-piece handle, the separate parts of which are hinged together in the manner indicated, leaving an opening just a trifle larger than the thickness of the brake lining which passes through it. The binding action between the two parts of the handle holds the free end of the brake lining tightly and prevents it from slipping when the handle is pressed downward.



An Easily Made Photo Cabinet

The cabinet shown in the illustration, constructed like a sectional filing case, was made from discarded boxes, and proved of considerable value in filing photograph prints, negatives, and other photographic material. The top section, made from a 12 by 15 by 24-in. box, contains three drawers. The upper one extends the full width of the box, and is used to store the camera, tripod, film, developing trays, and similar material. The two smaller drawers below this have an inside width of 5⅛ and 6⅝ in. The narrow one contains a bibliography on photography, and a card index, on 3 by 5-in. cards, of the mounted photographs and the negatives. The wider drawer contains film and plate negatives; these are kept in 6½ by 3⅝-in. plain manila envelopes, numbered in consecutive order, so that it is possible to find a particular negative quickly by referring to the subject index in the narrow drawer, to ascertain what the filing number is. The lower section contains one large drawer, in which are kept the photographs, mounted on 12 by 10½-in. pieces of cardboard. This size will hold five postcard-size photographs, three arranged vertically and two horizontally, or vice versa, as the card is held. Photos on related subjects are mounted on the same card and on adjacent cards. Each photo bears the same number as the corresponding negative and is listed in the subject index. Then if any group of photographs is wanted, it can be found and returned without any trouble. The lower drawer may also contain descriptive matter relative to the photographs, as well as books and catalogs on photography.



An Excellent Cabinet for Filing Prints, Negatives, and Other Photographic Matter: It Has a Subject Index, Referring to the Numbered Photographs and Negatives, and Space for the Camera, Tripod, and Developing Trays

This method of filing photograph negatives is particularly useful in connection with photographs of a commercial character, as for instance, construction details or machining operations, where it is generally necessary to file some descriptive matter with the prints, and where frequent reference is made to them.

The large drawer is very heavy when full, and to insure easy sliding, a roller should be made for it. For this purpose a porcelain telephone fuse will serve excellently. The end nuts are removed, and short lengths of hollow curtain pole are slipped over the threaded ends, to serve as journals. A slot is cut in the front lower crosspiece of the box, and the roller laid in it, as shown in the drawing.

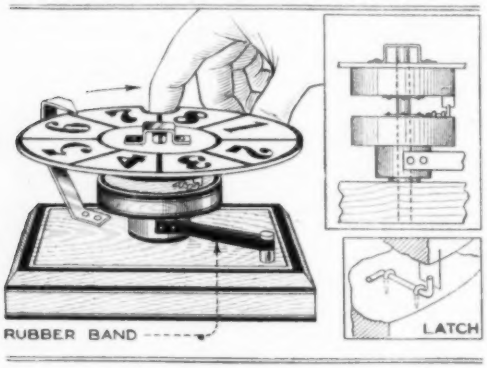
The method of construction is indicated in the drawing as well as the general dimensions. The panel strips are nailed on last, and give a very neat appearance to the cabinet.—C. N. Schuette, San Francisco, Calif.

Nonslip Ladder Rungs

When a bicycle tire is worn out, do not scrap it, but tack sections of it to the steps or rungs of ladders, thereby making them nonslipping. The inner side of the tire is slit the full length with a sharp knife, and the tire is then cut into pieces of the proper length, which are tacked to the rungs.—H. A. Gustafson, Chicago, Illinois.

A Spinning Dial for Games of Chance

The spinning dial shown in the illustration is an improvement over the usual



A Simple Spinning Dial for Games of Chance That is Spun by Pulling It Around a Quarter Turn with the Finger, and Then Releasing It

type, spun by snapping an index hand with the bent forefinger.

The wooden wheels can be cut from old spools, and the vertical axle used should be selected to fit easily in the spool holes. It is a short length of iron or brass rod, driven into a hole bored in the base block. The lower wheel is made up of a large and a small disk, glued together, and dropped over the axle, with a small washer between it and the block. A strong rubber band is tacked to the smaller disk, and stretched over a peg glued in a hole in the base, as shown. The upper wheel carries a dial made of heavy white Bristol board, with the numbers painted on it, and is supported on the axle by a small stirrup, made of sheet brass or tin and tacked to the wheel. Pointing the end of the axle, and making a centerpunch mark in the underside of the stirrup, in which the pointed end may fit, will make an easier-running dial, if found necessary. A wire latch, formed as shown and attached by staples to the lower wheel, engages with a short piece of sheet metal driven into the underside of the upper one. A sheet-metal index or pointer completes the device.

To spin the dial, it is pulled in the direction indicated by means of the finger, placed in a notch cut in the dial, about a quarter turn, then let go. The upper wheel pulls the lower one, by means of the latch, when turned clockwise, and, when the dial is released, the tension of the rubber band drives both wheels back. The upper one, carrying the dial, then spins freely, as the latch engages only in one direction.

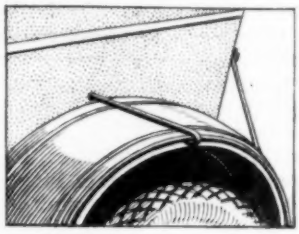
Lining Stove Fire Boxes

Fire boxes, whether made of wrought or of cast iron, usually become burnt and brittle, due to the intense heat, and, as a consequence, they soon deteriorate. To prevent this, stove manufacturers provide a fire-clay lining inside of the fire box. This lining, however, also disintegrates in time, and exposes the iron.

A mixture for lining fire boxes, that has been found to be extremely durable, is made of 6 parts potter's clay, 2 parts plaster of Paris or cement, 1 part wood ashes, and 3 parts carborundum in powder form. All of these ingredients are mixed well while dry. Water is then added to make a stiff paste, and this is applied to the parts requiring repair, or to the whole fire box. The carborundum in the mixture enables it to withstand the heat. After the stove is lined with this mixture, it should be allowed to dry for a few days. When starting the fire for the first time, it should be brought to the point of maximum heat gradually.

Bolt for Loose Truck Fenders

The illustration shows a simple method of tightening loose fenders on a light truck. A ¼-in. hole is drilled in the side of the body, just above the highest part of the fender. A long bolt, with the head cut off and the end bent over to form a hook, is hooked over the edge of the fender, and the threaded part is pushed through the hole in the truck side. By turning the nut on the inside, the fender can be tightened as much as necessary.



Flower Holder Made from Olive Bottle

Attractive flower holders for the porch and summer home are easily made from the tall, cylindrical bottles in which olives and pickles are packed. A piece of cretonne is sewed around the bottle just below the neck. The lower edge is gathered and drawn together under the bottle, and a tassel attached. A piece of colored ribbon or cord is sewed to the upper edge, so that the holder can be hung on a nail or hook in the wall.

A CHRISTMAS-TREE LIGHTING TRANSFORMER

By E. E. SCOTT

MANY who have admired a Christmas tree in a store window, ablaze with varicolored electric lights, have doubtless continued to use the dangerous wax candle for their own tree, after inquiring the price of a lighting outfit. Most of these outfits are expensive because it is necessary to furnish a small transformer for stepping down the voltage of the house-lighting circuit to the 6 or 12 volts required by the small decorative lamps.

It is not a difficult job to make a small transformer, however, and this article describes how the author made his own, from magneto punchings. The punchings used by the author were obtained from an automobile-junk dealer; if any difficulty is experienced in obtaining punchings of similar size and shape, ordinary shuttle-armature magneto punchings, which are common, can be used, by winding the wire on a 3-in. stack, without a form, and adding about one-tenth more wire to the low-voltage coil, to make up for magnetic losses, which are due to the fact that there is not a complete magnetic circuit.

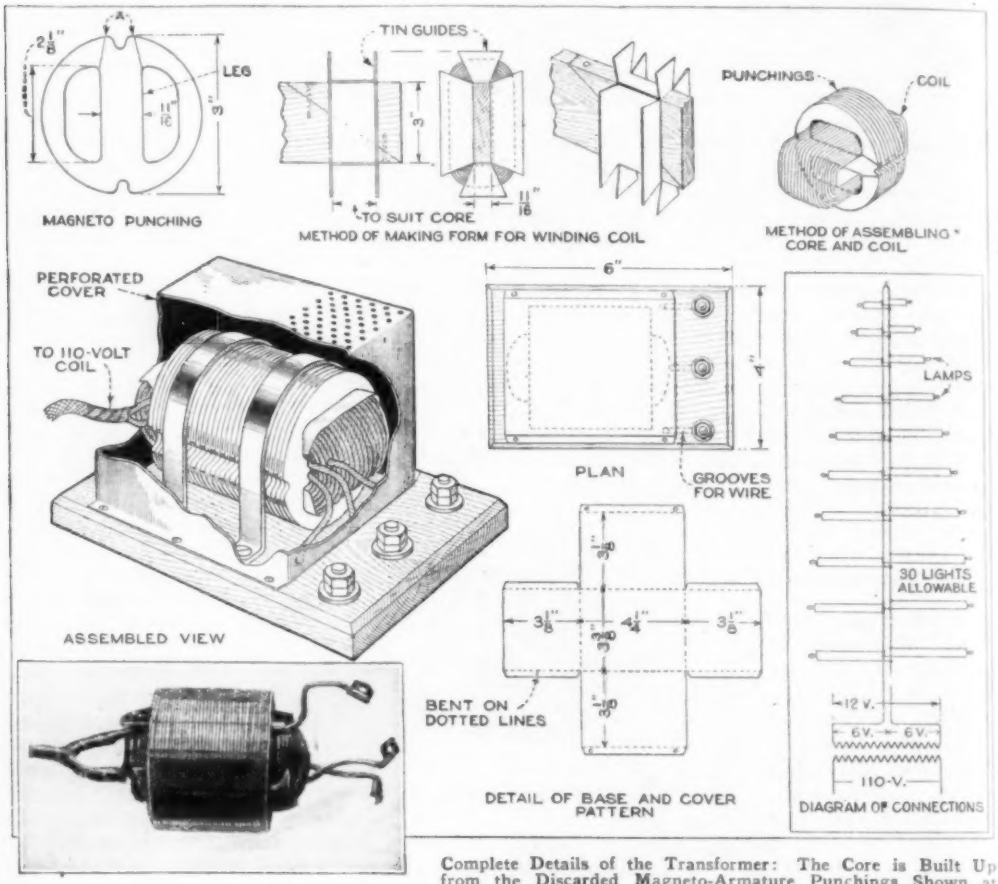
A Small Homemade Transformer for Lighting 6 or 12-Volt Christmas-Tree Lamps

The construction of the coil proceeds as follows: First, a wooden form is made, as thick as the center leg of the punching, or core; 3 in. wide, and long enough to be held conveniently in the hand. One end is beveled, as shown, and a triangular piece, of the same material, tacked in place of the piece cut off. This permits the winding to be easily removed, when complete. To provide sufficient clearance for the core to slip easily into the coil, some tin guides are cut and bent, as shown, and fastened to the form by a strip or two of adhesive tape; the ears on the guides keep the wire within the necessary limits, and aid in forming the coil properly. The width of the guides, between the ears, will depend upon the inside dimensions of the openings in the core. Having completed the form, wrap two layers of bond paper around it, and shellac them in place. Starting at either end, wind on 21 turns of No. 16 silk or cotton-covered magnet wire. At the 21st turn, scrape the wire bare, solder a thin strip of copper to it, tape the joint and strip, and continue winding. Between the layers of wire put a laye. of bond paper, shellacked on. When 21 turns more have been wound on, bring out all three leads, that is, both ends of the wire and the copper strip, to one end of the coil, and shellac two layers of bond paper over the coil.

Wind over this secondary coil a coil of 364 turns of No. 22 silk or cotton-covered wire (making no attempt to form layers, but taking care to prevent the wire from "bunching") and round the outer turns to conform to the shape of the inner diameter of the core. The ends of the coil should be bound down with tape, to prevent the wire from breaking, as it is quite fine. Remove the form and the tin guides, and proceed to wedge as many of the punchings as possible into and around the core. The punchings are cut, at the points marked A, so that they can be spread at these points, and the center leg pushed through the coil center. The length of the core, when wedged as tightly as possible, should be 3 in.. When completely assembled, slide some heavy paper between the outside of the coil and the inside of the core, as shown in the drawing. The completed core and coil should be soaked in shellac overnight, and baked in a slow oven for about 24 hours, when a hard, solid unit will be formed.

The next step is to solder pieces of bell wire, about 4 in. long, to the three leads of the low-voltage coil, and a long piece

of twin lamp cord to the leads on the high-voltage coil. A wooden base, of the dimensions shown, is then made, of ½-in. hardwood, and holes are drilled in it for shown complete in the drawing; they should be about 3/16 in. in diameter, spaced ½ in. apart, on both top and sides of the cover. The cover and base may now be



Complete Details of the Transformer: The Core is Built Up from the Discarded Magneto-Armature Punchings Shown at the Upper Left. The Insert at the Lower Left Shows the Completed Core and Coil, Ready for Mounting. A Wiring Diagram for the Lamp Cable is Given at the Right

three terminals and the three bell-wire leads; grooves are also cut in the underside of the base, as indicated, for the leads.

The coil is placed in position, and the low-voltage leads passed through the holes; then lugs are soldered to their ends, so as to make good contact with the terminal screws. When the latter are put in place, the low-voltage side is complete. The coil may now be fastened to the base, as shown, using strips of tin or brass, ⅜ in. wide.

A case of perforated metal should be made as shown in the drawing. A developed pattern for this is given, so the cutting and folding will be easy. The lapped edges should be soldered, to make the cover rigid. The perforations are not enameled green, to harmonize with the tree.

The remainder of the apparatus consists of a main cable, about 12 ft. long, at the end of which is attached the socket for the lamp for the tree top. The other lamps are connected by branch cords, as shown in the wiring diagram.

This transformer is suitable for a 110 or 115-volt, 60-cycle circuit, and will serve thirty 6 or 12-volt, 3-watt lamps. If one end of the cord is connected to either of the outer terminals, and the other end to the center terminal, the potential will be 6 volts. If the ends are connected to the outer terminals, the potential is 12 volts.

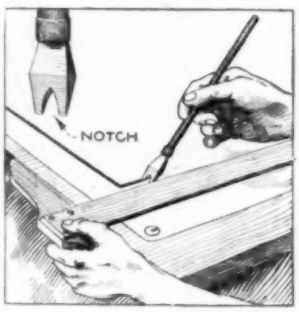
The lamp cord on the 110-volt side can be made as long as desired, and fitted with a plug to fit a lamp socket.

Towing the Dinghy

There are numerous little pitfalls that lie in wait for one who attempts to run a large boat single-handed, and these may cause much annoyance, besides entailing considerable expense. One of these accidents, commonly called the "dinghy nuisance," is to have the painter of the dinghy wind around the propeller. This may not result in serious damage, but at least means a job of disentangling the rope in the water, which is a very unpleasant task, especially in cold weather.

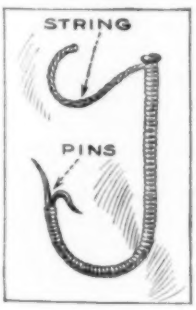
To avoid this trouble, one owner, running a motor cruiser on the Lake of the Woods, Manitoba, employed a novel method of keeping the painter out of the propeller. This he did by stringing the rope with fishing-net floats, spaced about 1 ft. apart, which kept it from sinking. With a bow fender on the dinghy to prevent possible injuries resulting from collisions, it was possible to navigate in crowded water without being annoyed by the painter.—H. Webster, Winnipeg, Can.

Shading Pen Draws Borders



An ordinary No. 4 shading or marking pen, with a notch cut in the center, as shown, to make two points, makes an excellent bordering pen. Only one side is filled with ink, the other being pressed against the T-square or triangle. A pen of this kind will draw border lines that are always the same width.—C. R. Jones, Chicago, Ill.

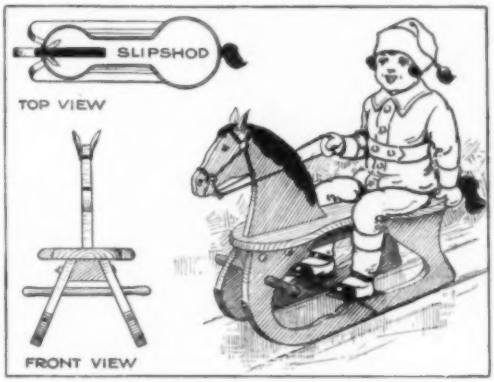
An Emergency Fishhook



When out of hooks on a fishing trip, it is a simple matter to make some from pins. Fine string or thread is wound around two pins so that only the points protrude. These are bent over and the line is tied below the heads. — Louis Teuteberg, Hann.-Münden, Germany.

Novel Type of Sled for the Kiddies

A novel sled, designed on the order of the three-wheeled leg-power cars so popular during the summer, will meet with



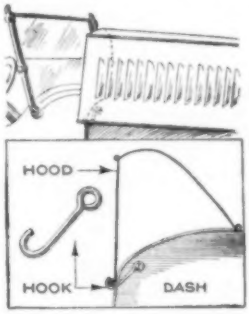
An Attractive and Sturdy Sled That Proves Very Popular among the Youngsters during the Winter

particular favor among the youngsters in the winter. Aside from the fact that it is solid and strong, it is higher than the ordinary sled, and thus prevents the child's clothes from dragging through snow and slush.

In constructing this sled, it is designed to suit the size of the child for whom it is intended. Lengths of flat or half-round iron are used to shoe the runners. When completed, the sled is painted to make it resemble a horse as nearly as possible.—F. J. Rosenberg, Redondo Beach, Calif.

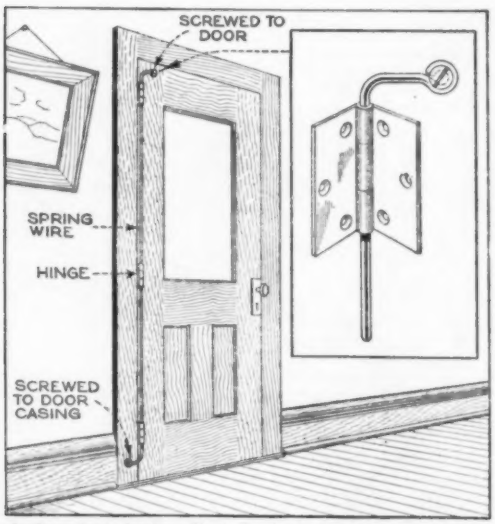
Automobile-Hood Holder

When one side of an automobile-engine hood is lifted, in most cases, it must be held or rested on the cowl, invariably marring the finish. A holder, such as the one illustrated, will prevent all possibility of marring the finish as well as any tendency of the hood to fall down and hit the repairman's hands or neck. A piece of stiff steel wire is bent to form the hook shown, which is fastened on the engine side of the dash with a large screw or small bolt. By experimenting a little, a position where the hood is well balanced can be found.



Door Spring Combined with Hinges

A very practical, neat, and inexpensive spring arrangement for closing doors is shown in the illustration. Although this



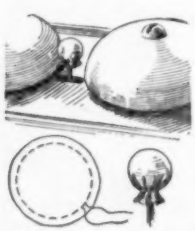
A Practical Spring That Is Neat in Appearance, and can Easily be Attached to Any Door

method was applied to a kitchen door, it is applicable to the doors of closets, cupboards, tool boxes, or any door that it is desired to close automatically.

After the pins were removed from the three butt hinges of the door, a length of steel wire, of the same thickness as the pins, was inserted through the hinges. Eyes were formed on the ends, which were then bent over and attached to the door and casing as shown, by means of woodscrews.

Muffling Sound of Telephone Bell

During sickness, it is often necessary to muffle the telephone bell so that its ringing will not annoy the patient, but may still be heard by others. This can be done very effectively by cutting out a circular piece of cloth, 1 in. in diameter, and running a length of string through cuts made around the edge, so that the cloth can be drawn tightly over the hammer and tied. When the bell is rung, the result will be a buzz rather than a ring. The cloth can be turned around when it wears through on the sides that make contact with the bells.



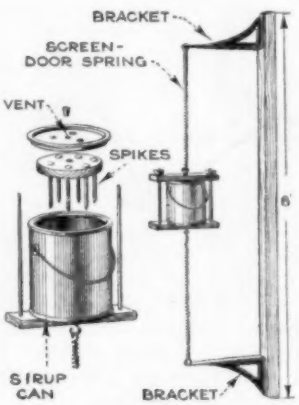
Re-Covering a Card Table

When the covering of a card table needs renewing, do not remove the old covering unless badly torn. Place two thicknesses of cotton wadding over the surface, and draw one thickness of strong cotton cloth over it tightly. Cover this with dark-green holland. This surface is soft and smooth, and enables one to pick up a card without drawing it to the edge of the table. It is also noiseless and easily dusted. The table top itself should be made of 3 or 5-layer plywood, so that it will not warp, and cause the cloth to wrinkle.—J. A. Beebee, Rochester, N. Y.

Churn Made from Sirup Pail

A simple churn, that will produce butter in a short time without much effort on the part of the operator, can be made at very small cost.

The material used to construct it can be easily obtained; it consists of a sirup pail, a small wooden disk, into which some long spikes are driven, a clamp to hold the pail, two small screen-door springs, two shelf brackets, and a wooden upright, about 6 ft. long. The wooden disk is attached to the can cover, by means of small wood screws, in such a way that the spikes project downward into the pail when the cover is in place. A small hole is drilled through the cover and disk and fitted with a cork. The pail is held in the clamp and is suspended between the screen-door springs; these are attached to the brackets on each end of the upright. The upright is screwed to a convenient wall.

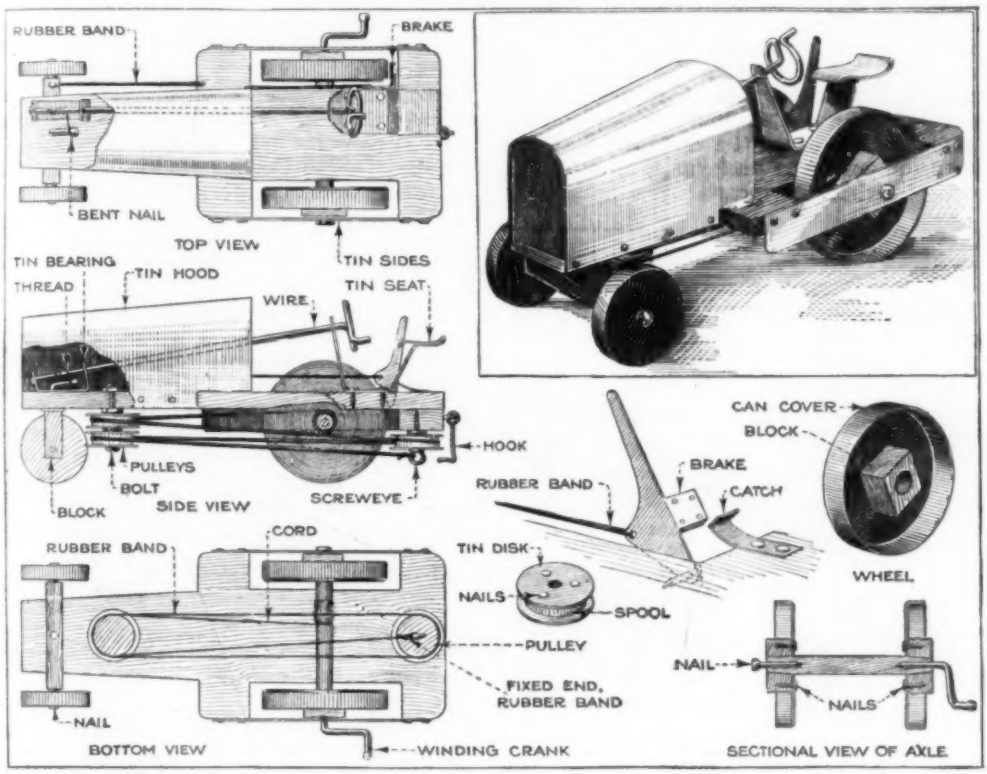


After the pail has been filled to within 2 in. of the top with sour cream, it is pulled down as far as possible and released. It will then move up and down very rapidly for some time, due to the alternate stretching and recoiling of the springs. By pulling the pail down and releasing it at intervals, the butter will be churned in a short time.—L. E. Owen, College View, Neb.

How to Make a Toy Tractor

By JOHN A. PRIOR

HAMMER, saw, and tin snips, or a pair of old shears, are the only tools required for making the toy tractor shown in the drawings. Driven by a form of rubber-band motor, it will run



A Simple Rubber-Band Driven Toy Tractor That will Provide Much Amusement for the Little Folks: It can be Made Quite Realistic in Appearance, will Run 15 to 20 Feet on One Winding, and, If a Strong Band is Used, will Draw Small Trailers

15 or 20 ft. on one winding over a smooth surface, and, if a sufficiently strong band is used, the tractor will haul toy trailers. As the size of the floorboard, or frame, depends somewhat upon the size of the wheels, dimensions are purposely omitted. A good length is at least three times the diameter of the large driving wheels, and the board should not be more than ½ or ⅝ in. thick, to keep the weight at a minimum.

The driving wheels are made from can covers, from 4 to 6 in. in diameter. The manner of fitting them to the axle is shown so clearly in the drawing as to require no explanation. The axle bearings are simply holes punched or drilled in tin strips tacked to the frame. The front wheels are pivoted to the body by a bent nail, which is connected to the steering-wheel axle by a thread, wrapped around the axle and tied to the nail head. The front wheels are turned to the left by the thread, and the tension of a rubber band, tacked to one side of the axle, and to the frame, as shown, pulls them around to the right when the steering wheel is turned in the opposite direction. The tin hood, seat, steering wheel, and brake, while not actually necessary, add to the finished appearance of the toy.

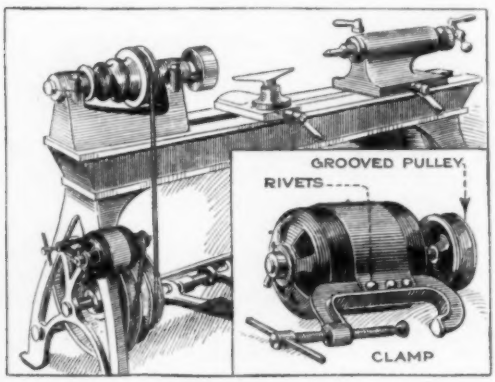
The most important feature of the tractor, of course, is the rubber-band motor, which is different from the usual twisted-band form, to meet the demand for slow speed and greater power. The tension of the rubber band acts through a cord wound onto the driving-wheel axle. To make the band long enough, it is passed around three pulleys, which are simply cut-down spools, mounted on nails for shafts. It is not essential that they be very free-running; in fact, a little friction at these points will help to hold down the speed of the tractor when the motor

is tightly wound. The pulleys are provided with flanges, made from tin disks, to prevent the band from slipping off. The rubber band is fixed to the rear-pulley axle, and passed around the pulleys in the manner indicated, the free end being attached to the driving cord fastened to the rear axle. The rubber band used should be a "live" one, and can be cut from an old inner tube. The driving cord should be small, but stout and smooth; fishline is best. The unstretched length of the rubber band should not be much greater than the distance between the front and rear pulleys. The motor is wound either by means of a nail, bent into the form of a crank, and driven into one end of the rear axle, or by turning the wheels. The size of the axle depends upon the strength of the rubber bands; 1½ to 2 in. is a good size to try. If there seems to be plenty of power, the tractor can be made to travel farther by cutting down the axle, but, of course, this will reduce the "drawbar pull."

When the motor is tightly wound, the wheels are likely to slip, but this may be overcome in several ways, either by reducing the diameter of the axle, adding weight over the rear wheels, or roughening the rims of the wheels by notching or punching holes in them with a nail.

Utilizing an Old Electric-Fan Motor

A fan motor has been found to be very useful for running a small foot lathe,



An Old Electric-Fan Motor, Attached to a C-Clamp, can be Used for Driving Any Light Machine

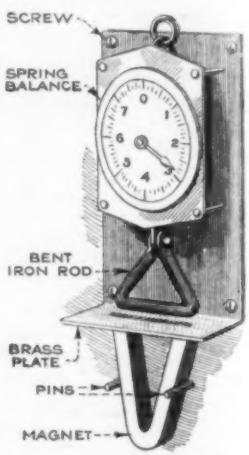
sewing machine, grinding wheel, or practically any other machine not requiring much power, and which is provided with a pulley.

To adapt a fan motor for such purposes, remove the stand, fan, and guard. Fit a steel band around the body of the motor, and rivet the band to a machinist's C-clamp, as shown in the illustration. To use the motor on a small foot lathe, clamp the motor to one of the supporting legs, and drive as shown. Provide the motor with a long lamp cord and a plug, so that it can be used at a distance from a socket.

A motor of this kind can also be attached to a carpet sweeper to revolve the brush at a high rate of speed, which is much more effective than when the brush is driven by the sweeper roller wheels. A heavy rubber band is used as a belt, and a pulley fastened to the brush shaft.

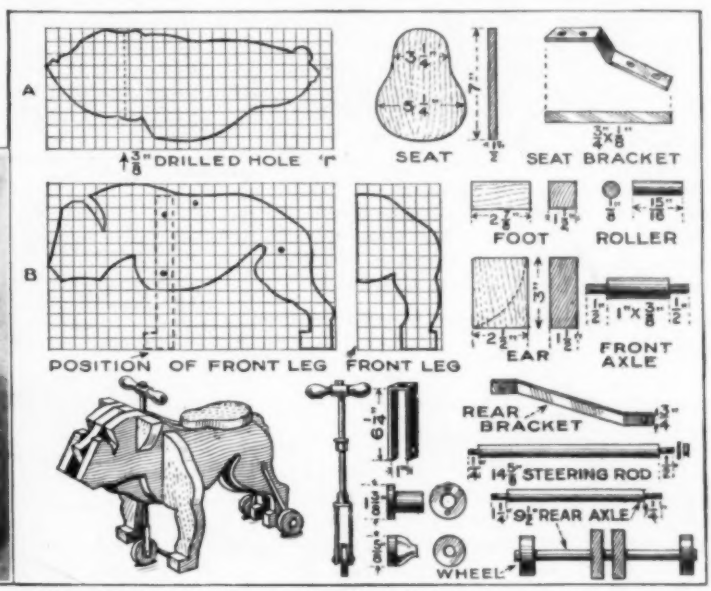
Testing Strength of Magneto Magnets

The magneto of a common car is incorporated with the flywheel, and consists of 16 permanent magnets that revolve in front of a stationary plate, to which a number of coils are attached. These magnets gradually lose their strength, and it is then necessary to remagnetize them. In doing so, it is desirable to provide some means of determining the relative strength of each magnet, in comparison with that of a new one, and for this purpose the testing device shown in the drawing is of considerable value. It consists of a spring balance attached to a vertical brass plate, the bottom edge of which is bent at right angles to form a stop. The plate is screwed to a wall. An iron rod, bent to triangular shape, as shown, is attached to the scale hook so that there will be a space of ½ in. between the lower edge of this rod and the brass plate. The magnet to be tested is brought against the brass plate directly under the triangular iron rod, so that it will exert a pull upon the rod. The strength of this pull will then be registered accurately by the indicator of the scale. Two pins may be driven into the wall, to support the magnet, as shown, although these are not essential.



A Novel Push Car

The push car shown in the illustration can be made from scrap lumber, and when properly painted, will make a splendid toy for a growing child. The illustration really does not do justice to the solemn doglike effect produced by the novel method of making the head; it is sufficiently realistic to please any small boy.



A Novel Push Car, Constructed and Painted to Resemble a Bulldog: It can be Made at Slight Expense, and will Provide an Endless Amount of Enjoyment for the Small Boy. The Body is Laid Out by Means of the Patterns Given

The first step is to lay out the design of the body and leg pieces. These may either first be laid out on cardboard, or directly on the wood. By ruling the surface of the wood or cardboard into 1-in. squares, it is a very simple matter to copy the design. The stock used for the body is ¾-in. pine. One piece is cut to pattern A, and two to pattern B; two ears and two forelegs and feet are then cut to the dimensions shown.

A ⅜-in. hole is drilled vertically through piece A, at the point indicated, for the steering shaft. This hole is counterbored top and bottom for metal bearings.

The forelegs are attached to the sides by long flat-head screws, put through holes bored in the legs, and countersunk. The feet are screwed and glued to the legs, and a ½-in. rod inserted through holes drilled in the legs to serve as a footrest. The three body sections are also fastened together by flat-head screws.

The steering shaft and the flat-steel front-wheel bracket, or housing, are welded together. The remainder of the fittings, and the manner of assembly, are made quite clear in the drawing.

Wood may be used for the wheels, but steel wheels, with a ⅝-in. hole, are preferable. Rollers, ⅛ by 15/16 in. in size, are used as bearings for the wheel, and are kept in position by nuts and washers.

When complete, give the "dog" two coats of flat white paint, then one coat of enamel. The head, tail, seat, and metal parts are enameled black, the eye slots and body white, and the tongue red.—E. W. Hosens, Cincinnati, Ohio.

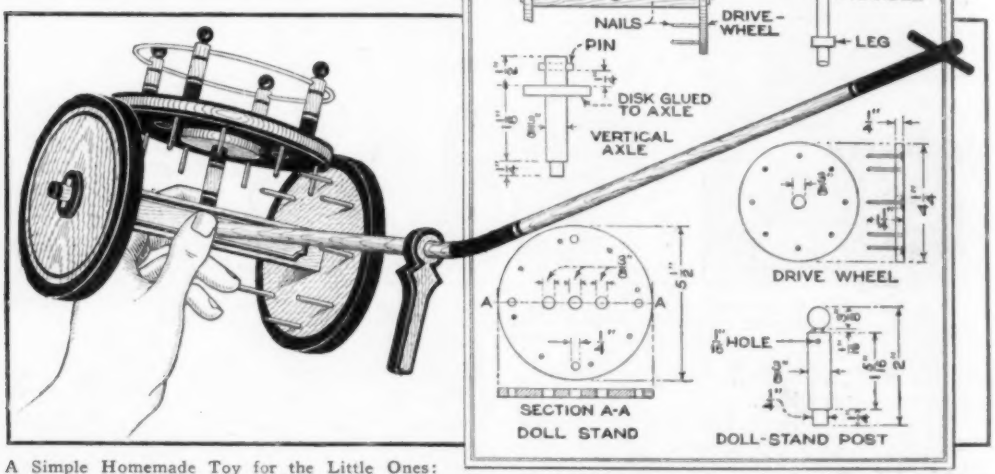
Pouring Fluid into Small Receptacles without Spilling

To fill receptacles with fluid from larger containers, without spilling, is quite difficult. By holding a moistened match, or toothpick, firmly across the mouth of the bottle, as shown in the photograph, the job becomes easy, provided care is taken to prevent the liquid from "gulping."

Making a Waltzing-Doll Wagon

A little device that will please the small "mother" immensely is shown in the drawing. It is a wagon with a revolving platform, upon which a doll is fastened so that as the wagon is drawn over the floor, the doll waltzes around.

The wheels and platform are cut out of ¼-in. plywood, to the sizes shown. The drivewheel has a number of finishing nails, 1¼ in. long, driven into it, as shown in the detail. The ends of the nails should be cut off, and all rough edges smoothed. A ⅜-in. hole is drilled in the center, for the end of the axle. The other wheel is like the drivewheel, but without the nails.



A Simple Homemade Toy for the Little Ones: A Doll, on the Platform, will Waltz in a Manner Entirely Satisfactory to Them When the Toy is Drawn along the Floor. The Making of a Toy of This Kind would Provide a Fine Exercise for Junior Manual-Training Students

The platform has three ⅜-in. holes bored in it, as shown; the center hole is for the vertical axle, while the other two are for the feet of the doll. Four ¼-in. holes are bored in the platform as indicated; these are for the wire-railing posts. These posts are made of ⅜-in. round wood, and plain round ones will do very well, if one has no means of turning the ends as shown. Nails are also driven into the platform, at such a radius that they will engage with those in the drivewheel, when the wagon is assembled. A better construction than the foregoing would be to use ¼-in. pegs for the teeth of the "gears." The ends of the pegs should be turned or cut down, and glued into 3/16-in. holes drilled in wheel and platform.

The horizontal axle is made of pine, ⅞ in. square, as shown, and the vertical axle and handle from ⅜-in. round stock. The railing on the platform is of 1/16-in. brass or iron wire. The remaining details are quite clear from the drawing.

All stationary parts should be glued in place, including the wooden pins (common matches) that hold the wheels and platform in place.

A toy of this kind provides a very good exercise for junior manual-training students, as it illustrates, in about the simplest manner possible, the principles of gearing. The toy will make a good Christmas present for little sister.—E. K. Wehry, Cedar Rapids, Ia.

Writing on Glass

When writing or lettering on glass, as, for instance, on the slides that are used extensively in moving-picture theaters for advertising purposes, it is impossible to make a neat job unless some preparation is used for coating the glass to prevent the ink from spreading. A simple but very effective substance for this purpose is the white of an egg.

Clean the glass perfectly before applying the white of egg. After covering the whole surface, allow the surplus to run off by holding the glass vertically. When the film has dried thoroughly, the ink will not spread in the least, and the lines can be drawn just as fine as desired.—C. A. Clark, Miyazaki, Japan.

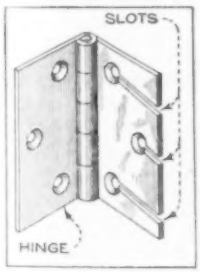
A Strong Waterproof Glue

A waterproof glue of excellent adhesive qualities can be prepared as follows: Soak ordinary glue in water until it swells but does not lose its shape, then drain off the water. Put the glue in a gluepot and add an equal quantity of linseed oil; cook this mixture slowly until the whole is a jellylike mass. It is then ready for use. It must be heated each time it is used.—W. S. Standiford, Youngstown, Ohio.

Making Small Ash Receivers

Capacious and inexpensive ash receivers can be made from the pressed-steel disks used to protect the ends of rolls of prepared roofing. The edges of the disks are rolled or hammered as shown, and mounted on octagonal or circular wooden bases by means of screws driven through the holes in their centers. A coat of enamel finishes the receivers, which are not easily upset.—A. C. Cole, Chicago, Ill.

Quickly Detachable Hinges

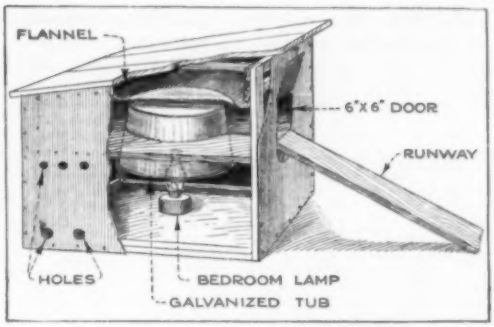


Ordinary butt hinges can be fitted to a light door so as to allow the door to be quickly removed, by cutting slots in the hinges at a slight angle, as shown. The slots must be wide enough to fit the screws used. The door can be removed by opening it, loosening the screws a few turns, and then sliding it off.

A Good Brooder

After experimenting a great deal with various kinds of chicken brooders, none of which proved to be entirely satisfactory, the brooder shown in the illustration was constructed, and gave excellent results.

It was built 3½ ft. square, and 30 in. high, with a floor 16 in. above the bottom of the frame, which was left open. A disk, 19 in. in diameter, was cut out of the center of the floor. A small opening, 6 in. square, was cut in one side of the upper section of the brooder, and fitted



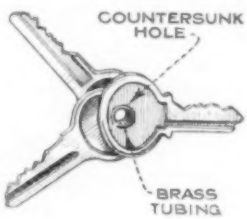
A Comfortable Brooder for Young Chicks: It can be Made in a Few Hours from Material at Hand on Any Farm

with a trapdoor and a 6-in. board, about 3 ft. long, to serve as a runway. A galvanized tub, 12 in. deep, 17 in. in diameter at the bottom, and 21 in. at the top, was fastened upside down in the circular hole in the floor, to form a radiator. A heavy-flannel cloth was nailed to the sides of the brooder, a little above the top of the pan, in order to retain the warmth. A door was then cut out in the lower section, large enough to allow a common bedroom lamp to be placed under the pan, and a few holes were bored in the side of this section to permit ventilation.—H. C. McKay, Eustis, Fla.

Novel Key Holder

Flat keys can be conveniently fastened together, as shown in the drawing, so that they do not take as much space, nor "jingle" as much, as they do when strung on a keyring.

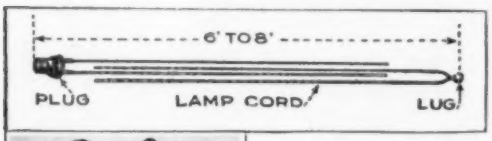
A ¼-in. hole is drilled through each key, the holes in the outside keys being countersunk on one side. A piece of ¼-in. brass tubing is used to rivet the keys together, and as the outside keys are countersunk, the riveted ends of the tubing will be flush with the surfaces of the keys. The keys can then be opened and closed in the same way as the blades of a pocketknife.



If some keys in a set have larger holes than ¼ in., they should be placed in the center. By using tubing for riveting the keys together, they can be put on a keyring with other keys, if desired.

Using the House-Lighting Circuit as Antenna

As it is not always possible, especially in congested cities, to have an outdoor aerial, and as a loop antenna is not very



An Inexpensive but Satisfactory Attachment That Enables the Amateur to Use the Lighting Circuit as an Indoor Antenna

efficient unless used with several stages of radio and audio-frequency amplification, amateurs are often confronted with the problem of providing a suitable antenna. It is possible, however, to hook up on the lighting circuit by means of the arrangement illustrated. This will give excellent results when used with a set that has one or two stages of amplification, providing there is not too much steel construction in the building.

Two pieces of common lamp cord, about 6 or 8 ft. long, are connected at one end to a plug. The other ends are well insulated by wrapping them, singly, with friction tape, so as to prevent them from coming in contact with each other and causing a short. Two other pieces of lamp cord of the same length are soldered at one end to a common terminal, or lug, while the other end of each is insulated as the first pair. The four cords are then assembled as shown in the drawing, with the plug at one end and the lug at the other, the whole arrangement forming a condenser. All four cords are then bound together into one cable by means of tape.

After assembling, the plug is screwed into a lighting socket, and the lug attached to the aerial post on the receiving set. By simply turning the socket key, as if to light a lamp, the device is brought in electrical connection with the network of wiring throughout the whole building. Surprising results can be obtained by this sort of antenna, although the signals will not be quite so loud as when obtained over a large outdoor aerial. With a two or three-step amplifier, it is usually loud enough.—F. L. Brittin, Chicago, Ill.

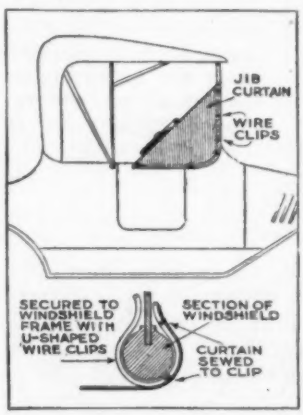
Preventing Corrosion of Firearm in Holster

Police officers, watchmen, and others whose work makes it necessary for them to carry a pistol, frequently find that it corrodes in the holster. This is due partly to the acids used in tanning the leather from which the holster was made, and partly to the moisture that the holster absorbs from the body and from the atmosphere. Flannel or chamois-skin linings are sometimes used to prevent this corrosion, but holsters provided with such linings are expensive.

An easy, inexpensive, and effective means of protecting the firearm against corrosion is to coat the inside of the holster with paraffin. To do this, the holster is warmed by holding it with the bare hand in an oven. Melted paraffin is then applied to the inside with a small brush. As the holster is warm, the paraffin will not harden on the surface as soon as it comes in contact with the leather, but will penetrate the pores. After it has cooled, and the superfluous paraffin is scraped off, the injurious acids of the leather, and the moisture of the body and atmosphere will not affect the pistol. Sportsmen will find this method also very practicable for preserving hunting arms carried in saddle scabbards.

"Jib" Curtains Increase Auto Comfort

The driver of an open roadster will find that the addition of the triangular "jib" curtains to his car will make driving in disagreeable weather considerably more comfortable without resorting to the bothersome side curtains. Curtains of the type shown can be left in place permanently and do not interfere with the car's accessibility.



The curtains can be made of any waterproof material, the front end being attached to the edge of the windshield by means of U-shaped wire clips, while the lower edge is provided with eyelets for attaching to the regular curtain fasteners.

PRIZE OFFERS AND ANNOUNCEMENTS

POSITIVE ELECTRICITY FLOWS UPWARD FROM THE EARTH

The electrical and magnetic condition of the earth is yet somewhat of a mystery. All of the conditions found and things happening have not been accounted for, and the data obtained are often conflicting. One matter which is now puzzling investigators is the amount and character of the electric current flowing across the surface of the earth. It is possible to determine the current passing across an area of any character by determining the total magnetic force acting around the boundary. The scientific investigating ship, the "Carnegie" of the Carnegie Institute of Washington, has cruised over a large portion of the seas, and the data obtained permit the magnetic force around several loops or paths to be computed; and the resulting electrical currents flowing from the surface of the earth can be determined.

The results found for the north Atlantic Ocean indicate a positive current of electricity streaming upward from the surface of the sea having a strength of about one-twentieth of an ampere per square kilometer. This result compares favorably with those obtained from a path taken about the United States, which is around land, where a current of positive electricity was found to be flowing upward of about one-thirtieth of an ampere per square kilometer.

STANDARD STATE ZONING-ENABLING ACT ISSUED BY DEPARTMENT OF COMMERCE

Zoning ordinances for the regulation of the use, height, and area of buildings are being adopted by cities in almost every state in the Union, and in some states where there is no specific authority for zoning, these ordinances may be set aside by the courts. For this reason an enabling act, under which municipalities can adopt zoning regulations, is advisable. For the assistance of those responsible for the framing of state zoning-enabling acts, a standard model for such an act has been issued by the Department of Commerce. It is a 20-page mimeographed document with footnotes covering questions which might arise in the wording of various sections and provisions. The publication may be obtained free of charge from the Division of Building and Housing, Department of Commerce, Washington, D. C.

FIFTH BIENNIAL NATIONAL CONTEST FOR PROFESSIONAL MUSICIANS

The National Federation of Music Clubs announces the fifth biennial national contest for young professional musicians. These contests are arranged in sequence: state, district, and national. The first will be held in each state between Feb. 15 and March 30, 1923. The entire United States has been divided into 15 districts, and the contests will be held in these districts between April 15 and May 5. The national biennial contest between winners in the district contests will be held at Asheville, N. C., in June, 1923. Contestants in the voice department must be between the ages of 20 and 30 years; those in the violin and piano department must be between the ages of 16 and 30 years. The national chairman is Mrs. Charles A. McDonald, 205 Shorb Ave., Canton, Ohio.

WORLD PRIZE CONTEST FOR THE BEST TREATISE REGARDING IMMORTALITY

For the best treatise on "The Christian Belief in Immortality in the Light of Modern Thought," a prize of $1,000 will be awarded by The Churchman. An honorarium will be awarded to each of at least two essays of "marked excellence." The contest is open to the world, and writers are recommended not to exceed 25,000 words, though no limit is set. Essays written in foreign languages must be accompanied by an English translation. The characteristics most desirable are personal conviction, cogency of argument and accuracy of facts, and literary style. The contest closes Dec. 1, 1923. Address: Contest Editor, 2 West 47th Street, New York City, U. S. A.

MANY PRIZES ARE OFFERED FOR STORIES AND PICTURES OF NOTABLE BUILDINGS

For the best stories and pictures of buildings and landmarks in the United States or Canada, whether merely of local fame or a historical structure, 77 prizes of from $250 to $5 each, will be awarded by an association of concerns interested in paints and varnishes. Stories, not exceeding 200 words, without pictures will be eligible for any prize, but preference will be given to the combination. The picture may be in the form of a photograph, postcard, painting, or pen or pencil sketch. More than one picture may be submitted with a story, and any number of stories by the same person. The contest closes Feb. 1, 1923. Stories and pictures in one package should be mailed to: Prize Committee, Save the Surface Campaign, Box 50, The Bourse, Philadelphia, Pa.

BASS AND TROUT OF UNEQUALED SIZE CAUGHT IN FISHING CONTEST

Two fish of record-breaking size were caught in the fishing contest of the Winchester Repeating Arms Company, announced in our issue of July, 1922. One was a bass, caught in Lake Serpentine, Fla., by O. C. Donehey, of Eustis. It weighed 18 pounds 8 ounces, and was 33 inches in length, with a girth of 28 inches. The other was a trout, caught by W. W. Reynolds, of Driggs, Ida., that weighed 10½ pounds, measured 28 inches in length, and had a girth of 17 inches. Both fishermen, of course, won prize rifles. The fish are said to be larger than any of their kind known to have been previously caught.

FOR BEST ESSAY ON MEDICAL RESEARCH, CASH PRIZE AND MEDAL ARE OFFERED

For the best dissertation on the results of original research in medicine, a prize of $500 is offered by the Boylston Medical Committee. In case the winning essay shows special originality in the investigations detailed, the Boylston prize medal will be added to the money prize. The subject of the dissertation may be chosen by the writer. Essays entered for this prize must be in the hands of the secretary on or before Feb. 1, 1923. His address is: Reid Hunt, M. D., Harvard Medical School, Boston, Mass.

CONTEST FOR A PLAY SUITABLE FOR OUTDOOR PRESENTATION

For an original play suitable for presentation on the outdoor stage, the Forest Theater of Carmel, Calif., offers a prize of $100. There is no limitation as to subject or scope, but the most desirable length will be a full evening play. Any play chosen will remain the property of its author, after three performances at the theater. Manuscripts, accompanied by return postage, must be in the hands of the secretary before Feb. 1, 1923. Address: Mrs. V. M. Porter, Secretary Forest Theater, Carmel, Calif.

TRADES AND AGRICULTURE TAUGHT TO DISABLED VETERANS

The opening of the first U. S. Veterans Bureau vocational school at Chillicothe, Ohio, under government supervision, inaugurates a new system in the rehabilitation of disabled veterans. All trades will be taught here, and the men who graduate from this school will be well worthy of employment by the business men of the nation, who are asked to coöperate in this manner in the movement.

WINNER OF THE PRIZE FOR BEST SLOGAN DESCRIBING DURHAM DUPLEX RAZOR

The judges have selected as the winner of the prize of $500 for the best slogan describing the Durham Duplex Razor, offered in the contest announced in our January issue, 1922, Mr. L. P. Cherry, of Minneapolis, Minn. His winning slogan was "Fewer Strokes for Busy Folks."

MISSOURI WRITERS' GUILD CONTEST FOR BEST SHORT STORY OR POEM

Any person who has been a resident of Missouri for six months is eligible to compete in the Missouri Writers' Guild short-story and poetry contest, provided such person has not had more than two stories or poems published in magazines of national circulation. One prize of $100 for the best short story, and one of $25 for the best poem, will be given. The contest closes March 1, 1923. Address: Contest Secretary, Kansas City Chapter, Missouri Writers' Guild, Kansas City, Mo.

U. S. CIVIL SERVICE EXAMINATIONS TO FILL VARIOUS VACANCIES

Applications from structural-steel draftsmen to fill vacancies at Pearl Harbor, Hawaii, at $7.20 and $7.60 per day, with an additional 96 cents per day while at the station; a vacancy at St. Thomas, Virgin Islands, at $6.80 per day, and vacancies in the United States at higher, lower, or the same salaries, will be rated as received until Dec. 29, 1922.

Applications from instrument makers to fill various vacancies at salaries ranging from $900 to $1,800 a year, plus a bonus of $20 a month, will be rated as received until Dec. 30, 1922.

Applicants for any of the above positions should write at once for Form 1312, stating the title of the examination desired. Address Civil Service Commission, Washington, D. C., or the Secretary of the U. S. Civil Service Board in the applicant's vicinity.

SPECIAL CANADIAN INSTITUTE PRIZES FOR ARTICLES ON CHEMISTRY

To members and students of the Canadian Institute of Chemistry, resident in Canada, a first prize of $50 and a second of $25 are offered for the two best articles on the function of the modern chemist in industry, accepted for publication by any Canadian magazine, national in scope and of a business or literary nature. Articles must contain at least 3,000 words. The competition closes May 1, 1923. Address: Secretary, Canadian Institute of Chemistry, Toronto, Ontario.

RECORD MOTORLESS AIRPLANE FLIGHTS MADE IN A CONTEST IN ENGLAND

The notable successes of French and German motorless flights raised the question in England whether they had fliers there who could rival the feats of their foreign colleagues, and to settle it a prize of £1,000 was offered by the Daily Mail. The most notable achievement of the first day of the contest was a 37-minute glide by M. Fokker, the well-known Dutch airman, but this was afterward far surpassed by F. P. Raynham, a British aviator, who remained in the air in a motorless airplane for 1 hour and 53 minutes. On the last day of the contest two world records were established. In a Fokker biplane, J. R. Olley remained in the air with a passenger for 49 minutes, while the French airman, M. Maneyrol, in a tandem monoplane glider, won the Daily Mail prize by remaining in the air for 3 hours 22 minutes, thus beating by 12 minutes the previously established record in Germany by Hentzen.

CONTESTS PREVIOUSLY ANNOUNCED

Medals, Diplomas, and Money Awards: Announced August issue, 1921; awards offered by the Franklin Institute. The Franklin medal is for workers in technology; the Elliott-Cresson is for original research work and invention; the Howard N. Potts is for important development of previous discoveries and inventions. Each award consists of a gold medal with a diploma. There are also a silver medal, and a Certificate of Merit awarded for meritorious discoveries, and cash premiums for certain work in optics.

One Million Francs for Best Motor: Announced January issue, 1922; closes June 1, 1923; address, Aero Club of France, Paris.

Research Thesis by a Woman: Prize $1,000; announced October issue, 1921; awarded annually; address, Dr. Lilian Welsh, Goucher College, Baltimore, Maryland.

Annual Commercial Airplane Contest for "Italy's Great Trophy": Announced July issue, 1922; address, Aero Club of Italy.

Best Novel by an American Author: Prize $2,000; announced August issue, 1922; closes March 1, 1923; address, Harper & Brothers, New York City.

Competition for American Composers: Prizes from $1,000 to $100; announced October issue, 1922; closes Dec. 15, 1922; address, Mrs. Edwin B. Garigues, Room 201, Bellevue-Stratford, Philadelphia, Pa.

Best Symphonic Composition: Prize $1,000; announced October issue, 1922; closes Jan. 1, 1923; address, Balaban & Katz, 175 N. State St., Chicago, Illinois.

For Many Kinds of Needlework: Three special prizes of $100 each, and 162 class prizes from $100 to $1 each; announced December issue, 1922; closes Dec. 31, 1922; address, Star Needlework Journal, 260 West Broadway, New York City.

HINTS TO ENTRAPPED MINERS BY THE BUREAU OF MINES

From a recently issued bulletin of the United States Bureau of Mines, come the following hints to miners who may, when entrapped as the result of mine fires, shut themselves in crosscuts by erecting bulkheads:

1. When entrapped by gases, and forced back into a crosscut or drift in which is comparatively good air, keep in mind the thought of building a bulkhead, and collect tools, timber, water, and other necessities while on the way there.

2. Before constructing a bulkhead, make sure that there is no manway, or other connection, with another level, through which fumes could come. Also see that the drift is not in broken ground, or stoped through from a lower level, and back-filled with loose material through which gas could find its way. Even if a tight bulkhead be made, if these conditions are present, the inclosed area will soon fill with gas.

3. Under these conditions, with from 8 to 29 men employed, a bulkhead may be put up in from one to four hours' time.

4. When erected, test a bulkhead for leaks by means of a candle or carbide lamp.

5. If there is a compressed-air pipe with hose attached leading into the drift, and if gas is coming in during erection of the bulkhead, station a man blowing air from the hose to keep the gas from entering the drift or crosscut.

6. Use a minimum of lights when in a bulkhead region, as these consume oxygen.

7. The flame of a burning candle or lamp will show the condition of the confined air, and also how the oxygen is being used up.

8. Do not gather in one place, but keep moving in the drift as much as possible, so as to prevent the air from becoming stagnant.

9. A bulkhead drift, 250 feet long and 6 feet high by 6 feet wide, contains 9,000 cubic feet of air, which at the disastrous fire in the North Butte Mining Company's Granite Mountain shaft kept 29 men alive for 36 hours; and one 130 feet long and 7 feet high by 7 feet wide, containing 6,370 cubic feet, supported six out of eight men for 50 hours, and would have sufficed for all eight men for 65 hours if the air had been circulated by the men moving about.

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